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1936

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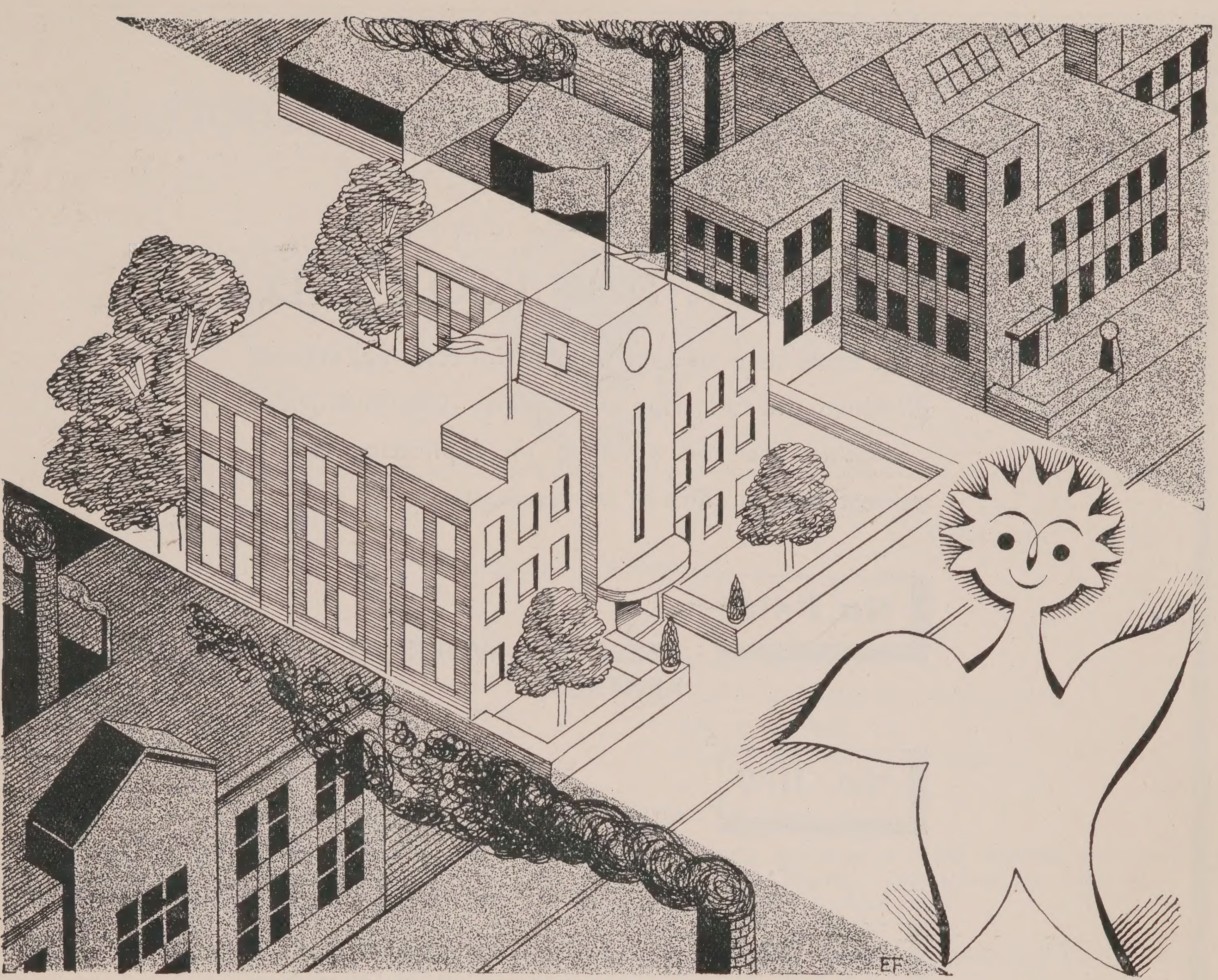

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The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.

COMMENTARY

It is with a feeling of pleasureable anticipation that we are able to make a preliminary announcement of what is likely to be one of the most important events planned for many years. By permission of the Director, a smoke abatement exhibition will be held in the Science Museum, South Kensington, during the whole of October next. The exhibition is being organized by the Society, with the co-operation of the Science Museum authorities, and the exhibits, it is expected, will be prepared in conjunction with other departments and associations, including the Department of Scientific and Industrial Research. The Society's annual general meeting and conference will be held in conjunction with the exhibition and it is expected that special conferences will also be arranged. A general exhibition committee and a technical advisory committee have been set up to make the arrangements and have already started their work.

A number of smoke abatement exhibitions have, of course, been held in the past, the last two being in Manchester, in 1924 and 1929. Members of the old Coal Smoke Abatement Society will remember the International exhibition held in London in 1912 which, to judge from the catalogue and conference report, was remarkably comprehensive and successful. These early exhibitions were run on more or less commercial lines : that is, they were largely displays of the appliances and fuels by means of which smoke could be reduced, and the stands were rented to the purveyors concerned. The forthcoming exhibition at South Kensington will, however, be in a different category. It will be primarily of an educational and scientific nature, and the exhibits will be chosen and classified to give a broad, unified view of the whole of the problem and its solution.

It was announced in the last Annual Report that the 1936 Annual Conference would be held, by invitation of the Public Health Committee, in Leeds. In view of our opportunity of holding the South Kensington exhibition during this year the Leeds Health Committee have very kindly agreed to postpone their invitation until 1937, and our appreciation of their very helpful and understanding action must be recorded. It is hoped that the impetus to the movement given by the exhibition and its associated activities will result in a far better conference at Leeds in 1937 than was to be expected for the present year.

We print in this issue a report of some of the opinions expressed on smoke abatement at the recent Coal Convention. Some of the statements we are glad to see ; others call for comment, but they may perhaps be left to the reflection of our readers. We will restrict ourselves to wondering, if smoke abatement is as unimportant as Mr. Cleland says it is, why he should have taken up the time of the convention by devoting a speech to saying so. His attack upon the integrity of the Society is the same as that made by him, as Councillor Cleland, to the members of a local authority a little time ago. His analysis of the sources of our income is misleading because it takes no account of the constitution of the Society, and is erroneous in other important respects. His anxiety about us is flattering.

As London will be the scene of smoke abatement activity in the autumn the usual summer meeting there will not be held this year. Members are asked to note that arrangements are being made for a visit to Birmingham in April for the purpose of inspecting the new grit collecting plants at the Birmingham Power stations. A meeting will be held in the late morning (following a meeting of the Council of the Society) at which the plant will be explained by an address by the Chief Electrical Engineer, Mr. F. Forrest. After lunch the party will be taken to the stations by special buses, and will later be brought back to the city. Full particulars will be sent in due course to all members, but in the meantime the date may be noted : Thursday, April 2nd.

At the time of writing the outcome of the coal negotiations is uncertain. It is not the function of this *Journal* to discuss the pros and cons of the dispute, even though, apart from anything else, the wages and conditions of life of the miners in relation to their unenviable occupation, should merit and receive the active sympathy of all. The industry too, considered as an economic entity, is undeniably in an unhappy condition, and no matter what the causes and remedies, is the concern of all. It is in certain ways the especial concern of the smoke abatement movement, for it would be difficult to press forward this reform if it meant increasing the troubles of the industry or the hard conditions under which the miners live. Fortunately, the abatement of smoke, which is a product of the misuse of coal, must come about by the better utilization of coal, and although this may mean new methods and therefore a certain amount of adaptation to them, it will be to the ultimate benefit of both the industry and those who live by it. Sir Frank Smith, secretary to the Department of Scientific and Industrial Research, in his paper printed in this issue, confirms this all-important truth when he says that " preventable waste is always bad economics, and must finally be a hindrance to progress, whereas better utilization leads in the end to an increase in demand. This applies to coal as much as to any other material." It may be remembered that the Samuel Commission declared that " the work of over a million men for three days every year is devoted to providing the soot which pollutes our atmosphere."

SMOKELESS ZONES

By CHARLES GANDY, (Chairman of Executive Committee, N.S.A.S.)

Perhaps it is not unfair to say that the average man or woman takes but slight interest in matters of Local Government until he or she is personally affected by some new regulation, and that it is not long before such a new regulation, however startling at its first appearance, is complied with as a matter of course. Such persons naturally know little or nothing about the objects of the Society which publishes this *Journal*. On those occasions—usually very foggy days—when they think of the smoke nuisance, it is usually with a mildly indignant " Why don't *they* do something about it ? "—the word " they " meaning " the Authorities " generally or even if the speaker has heard of it, our Society. Those directly concerned with the effort to reduce smoke are perhaps too ready with a reply, *e.g.* that legislation cannot go ahead of public opinion, that we are doing what we can to educate the public, or that until adequate supplies of smokeless fuels are available no element of compulsion in regard to the use of such fuels can be introduced. In reality, we know perfectly well that public opinion is waiting for an active lead, that only a small minority of the public can be educated except by means of regulations actually in force, and that by making the use of smokeless methods compulsory even to a very limited extent an immense stimulus would at once be given to the production of more adequate supplies both of suitable smokeless fuels and of appliances for their use.

In regard to industrial smoke, regulations do already exist and the application of such regulations is, thanks to the efforts of the Society and of members and officers of Authorities interested, becoming constantly more effective, and at the same time stimulating research and inventions which result in new and better methods of fuel utilization in the industries concerned. The purpose of this article is to consider how far it may now be possible to extend the Law to domestic and office smoke, with similar beneficial results.

Obviously it is impossible, having regard to the inadequate supplies available, to make the use of smokeless methods immediately compulsory throughout the country. For the same reason, most people doubt the desirability of attempting to penalize the use of raw coal by placing a tax on coal sold for domestic purposes, as this would fall heavily on those who can least afford it. Other suggestions for action by the Authorities include subsidies for approved smokeless fuels, relief to ratepayers whose buildings are guiltless of smoke emission, or that the production of smokeless fuels, including gas and electricity, should be speeded up by fixing a date some years hence for their compulsory general use. It has also been suggested, I think by Col. Bristow, of Low Temperature Carbonisation Limited, that private consumers wishing to burn coal in its raw state should be obliged to take out a yearly licence entitling them to do so, and that funds so raised could be applied for the cheapening of smokeless fuels. For a variety of reasons, partly financial and partly arising from the great diversity of conditions in different parts of the country, it has been felt that such suggestions for legislation of a general character dealing with domestic smoke emission are at present impracticable.

A New Suggestion.

More recently another suggestion has been made, I think first publicly by Mr. Norman McKellen, an Incorporated Accountant and Chairman of the Manchester Ratepayers' Council, though similar suggestions have reached me from various independent sources, that instead of attempting any general legislation, an attempt should be made in the first place to secure regulations for the entire prevention of smoke within comparatively small areas, and particularly in the central areas of large cities. So far as I am able to gather this suggestion has met with considerable approval in all quarters where it has been seriously considered and is quite practicable. Of recent years considerable attention has been given to Town Planning, and more particularly to the planning of City Centres with the object of making them worthy of the dignity of a great city. In many cities new city halls, libraries, art galleries and other public buildings have been erected or are contemplated involving large expenditure of public money. Such expenditure, so far at least as the external beauty of the architecture and settings is concerned, seems a mere waste of money in an atmosphere heavily laden with tarry soot and corrosive acid. In and near the centres of most of our large cities great commercial buildings have also recently been erected, and many attempts are being made to clean the surface of existing buildings. There is certainly a strong popular desire for more light and colour in the central areas of our cities, and the modern business world is beginning to respond. Most modern buildings in these areas are entirely smokeless, and in many offices, as well as in hotels and restaurants, and other business premises smokeless methods are in use for heating and cooking. The object of the suggestion is to extend these methods to all buildings within such an area, where it may reasonably be said that the coal fire is already an anachronism. Various objections have, however, been raised to the suggestion, which I will consider.

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Objections Considered.

It is, for instance, objected that "smoke knows no bounds," and that the prohibition of smoke within a limited area would be of little practical value. This objection forgets that the most damaging smoke, coming from the office or domestic fireplace, is heavier than industrial smoke and on a still day falls comparatively near its source. Anyone familiar with city life knows how smuts descend from nearby chimneys. Further, as the benefit of such a smokeless zone or area comes to be realized it is likely that the area will be voluntarily extended.

Another objection is that it would be unfair or undesirable to differentiate between the buildings within such a zone and those outside it. It should, however, be remembered that all Town Planning means differentiation, and that the occupation of valuable sites near the centre of the city is a privilege, in return for which the public are entitled to require that any buildings on such sites shall be particularly free from offence. Again those who are paying for the privilege of occupying premises on these expensive sites and themselves use smokeless methods are particularly entitled to be protected, so far as possible, by the placing of some restriction on their immediate neighbours. A differentiation possibly more open to criticism is involved in the suggestion that municipal housing estates should be compulsorily "smokeless," but such criticism would be less effective if it were known that a similar restriction had been placed on the (comparatively) wealthy city centre.

There are people to whom liberty to put what fuel they please on their own fire seems sacred, but such people forget that the fuel does not remain where it is put, and that the enjoyment of unpolluted air and light is itself a fundamental liberty which those in authority should do all in their power to protect. The immediate result of the suggested regulation (of which due warning would of course be given), would be that those whose business it is to provide smokeless substitutes would compete with one another to meet the wishes of their new customers and to provide the most generally satisfactory substitute.

Whether a solid smokeless fuel, or gas, or electricity is used will depend on the particular circumstances of each case; but once a suitable grate or appliance and the right fuel have been secured, few occupants of city premises would willingly return to the old fashioned burning of raw coal, with its attendant dirt and labour and storage trouble. Any additional expense involved in the use of smokeless methods is negligible compared with the rent and rates of city premises, and is soon repaid by the greater cleanliness enjoyed.

Ways and Means.

The manner in which the suggested regulation could be established and its observance enforeced would require careful consideration. Under Section 12 of the Town and Country Planning Act of 1932 Local Authorities have power to include in a Town Planning Scheme provisions imposing restrictions on the manner in which any buildings may be used, and the section expressly provides that the restrictions may be made applicable, either with or without modifications, to existing buildings as well as to new buildings. There seems no valid reason why under this section provisions should not be included restraining the user of buildings within a specified area in such manner as to cause atmospheric pollution. Alternatively, the regulation could be the subject of a Bye-Law such as a City or Borough Council has power to make, subject to confirmation by the Minister of Health, under Section 23 of the Municipal Corporations Act, 1882. Private Bills, sometimes in the form of omnibus bills covering a variety of matters, are often promoted by Corporations, and powers to make the suggested regulation could be included in one of these. Possibly even the passing of a general Act could be secured, enabling Local Authorities to make regulations within their own areas as they should think fit, though in the opinion of the writer this is unlikely unless the initiative comes from Local Authorities themselves.

One thing at least would result from a real attempt to secure such "smokeless zones." The importance of smoke abatement would step into the news, and become a subject of the public discussion it deserves.

A New Publication from Pittsburgh.

"The Municipal Smoke Problem" is the title of a new booklet written by H. B. Meller and L. B. Sisson on the Mellon Institute of Industrial Research, and is a practical little text-book on fuels, intended for the use of students. The nature of the common fuels is described, followed by an explanation of combustion and its essential requirements, a description of the way different fuels burn, and of the products of combustion. The booklet closes with a section on the effects of air pollutants, and notes on how to get clean air.

The same authors also contribute an article equally practical, to *Industrial and Engineering Chemistry* (Vol. 27, p.1309, Nov. 1935) on "Effects of Smoke on Building Materials.

A new aspect of the problem, of rapidly growing importance, is considered by the article—the complications caused by smoke to air-conditioning equipment. Larger filters are required in smoky districts, and the sulphur and other pollutants cause corrosion leading to failure of the equipment or to costly repair or cleaning bills.

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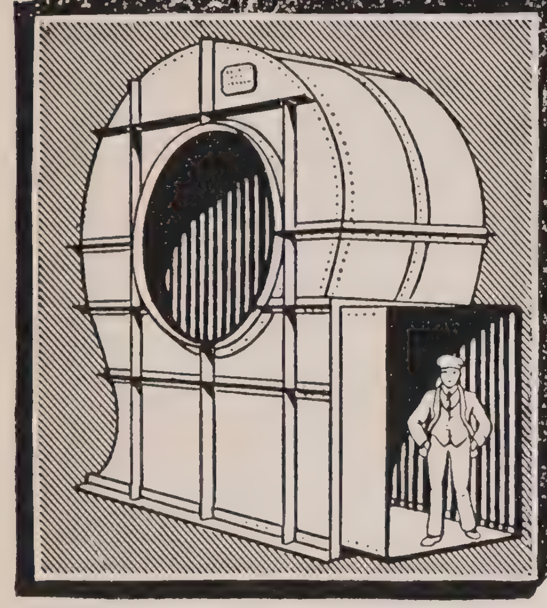

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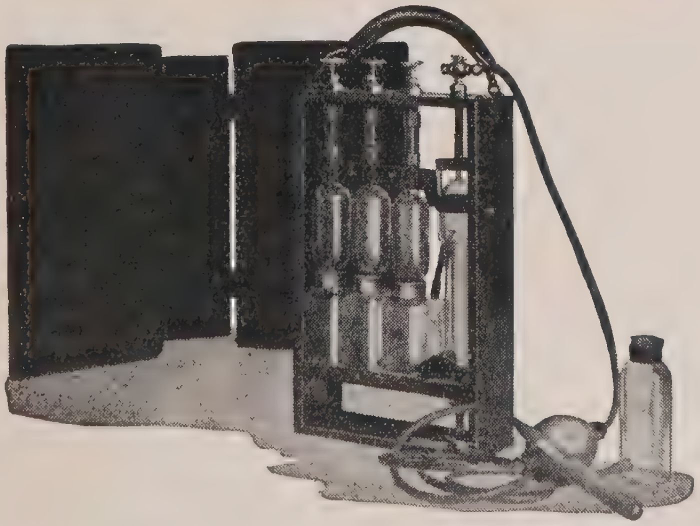

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SMOKE AND THE ZOO

HOW THE ANIMALS ARE AFFECTED

Reference was recently made by a writer to the difference in appearance of some of the animals at Whipsnade compared with their fellows at the Regent's Park Zoological Gardens, which was attributed to the cleaner air and surroundings at Whipsnade.

Inquiry to Dr. Julian S. Huxley, the secretary of the Zoological Society has resulted in some interesting and useful information, kindly given by him and by other officials of the Society.

A great many of the animals at Regent's Park have very dirty coats as a result of London's smoke and fog. Polar bears and birds with soft white plumage, such as Spoonbills and White Peafowl, become extremely dirty, whereas at Whipsnade they remain white. Not only is the appearance damaged, but the dirt affects the condition of the coat and the general health of the animals.

As with humans, the health of the animals is directly affected by the continuous respiration of polluted air, and much suffering and distress occurs during a foggy period. Col. A. E. Hamerton, Pathologist to the Society, states that " there is no doubt that atmospheric pollution by carbon particles from smoke and motor exhausts, also stone dust of a gritty nature and tarry particles from the roads cause a large proportion of pulmonary diseases among the animals in the Zoological Gardens." It may be suggested that some of the gritty particles may be from industrial chimneys, and that some of the tar may have been derived from the domestic fire, the smoke of which contains a high proportion of tarry matter.

" Animals in confined spaces," continues Col. Hamerton, " suffer most from dust, especially in foggy weather. The pathological changes known as anthracosis, caused by deposition of carbon particles, and silicosis, caused by deposition of siliceous particles, in the pulmonary tissues and their associated lymph glands, progress gradually and end fatally after some years of life in a dusty atmosphere.

" Many Felines in the Lion house die from chronic bronchitis, fibrosis and gangrene of the lungs associated with blackening of the lungs by dust deposit.

" Among birds that have lived for some years in the aviaries fatal necrosis of the lung localized around carbon deposits causes many deaths ; such necrotic foci in the lung are frequently colonized by tubercle bacilli which rapidly become disseminated with fatal results."

Col. Hamerton points out that there are two kinds of lethal dust in London air, namely chemically active dust, which is more or less soluble and is dissolved by the tissue cells which are poisoned thereby, and mechanically active dust that acts like a foreign body in the tissues and causes proliferation of fibrous tissue, or sclerosis of the lungs and impaired respiratory efficiency.

The mentally depressive effects of fog and its associated gloom are familiar enough among ourselves (although perhaps not sufficiently stressed) and the Superintendent of the Regent's Park Gardens agrees that the same effect is noted among the animals at such times. Such depression and loss of vitality naturally tends to affect physical health.

In some respects the animals are able to combat the effects of smoke more effectively than many of us, for artificial light is now used extensively together with extra vitamins added to the food. This has overcome the considerable amount of ill-health that used to occur during the winter, but it is stated that the expense of the preventive measures is appreciably higher than it would be if Regent's Park enjoyed the atmosphere and intensity of light obtained at Whipsnade.

We are greatly indebted to Dr. Huxley and his colleagues for this information they have been good enough to give us. It is valuable not only in itself but because, being based on lengthy authoritative observations, it may be taken as representing the general effect of smoke pollution upon animals in general in our towns. It is evident that the health and well-being of domestic pets must be similarly affected, and that in farms and small-holdings in industrial areas and on the outskirts of the large towns the health and economic value of livestock and poultry must be diminished.

Heat Treatment of Steel.

A valuable addition to the B.C.G.A.'s series of publications on the industrial uses of gas is " Heat Treatment of Steel." It contains a remarkably concise explanation of the theory of the various processes of heat treatment, explains the real significance of the terms used and states the requirements of each class of work. The next section deals with the design of gas furnaces and indicates the circumstances in which different types should be used. The last section describes some twenty odd representative modern installations and the book is illustrated with photographs of the plant described.

The publication may be obtained free on application to the British Commercial Gas Association, 28, Grosvenor Gardens, London, S.W. 1.

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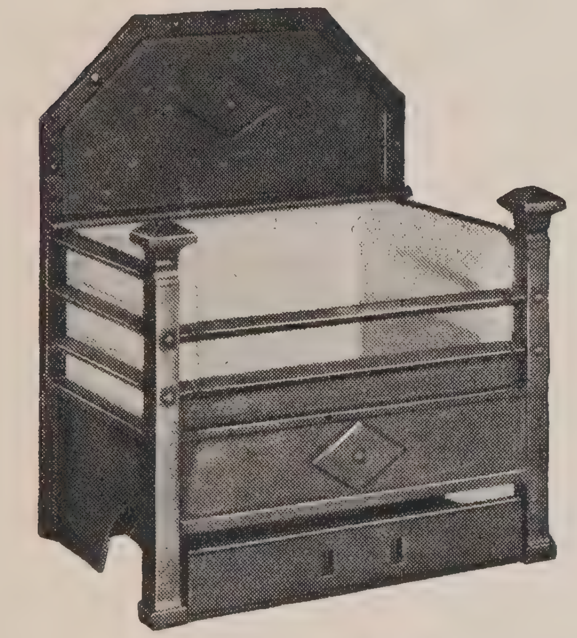

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THE COAL CONVENTION

AND THE SMOKE QUESTION

The first National Coal Convention, organized by the Coal Utilisation Council, was held in London on November 21st, and 22nd, 1935. We extract, from press reports of the convention, a number of references to smoke abatement and allied questions.

Mr. R. A. Burrows, Chairman of the Lancashire Collieries' Association, in the course of a paper on "Modern Trends of the British Market" said: "Coal owners do not like smoke or dirt any more than do other people, but they do object to the apparent simplicity of the smoke abatement enthusiasts who imply that it is only their mulish obstinacy that prevents any change. The smoke abatement crusade naturally attracts to itself all people of goodwill, but it derives its financial support very largely from those who look to financial reward as a result of the change.

"It is idle to suppose that the change can be effected easily, it may be well that the beneficial results from the change may justify the cost, but that cost should be stated and a realization of what it involves understood by those who are called upon to decide the matter. The whole subject requires careful consideration by all the parties concerned, the public who foot the bill, the makers of coke ovens and other plant, the coke makers, public utility or private company, and the coal ownes who provide the raw material.

Woolly Theories of Idealists.

"We shall be in a better position to combat the woolly theories of the idealists who in season and out of season urge the use of smokeless fuel without recognizing that, apart from one or two proved methods of producing smokeless fuel, the problem is by no means settled, and who, further, ignore the consequential changes in the economics of the colliery if all household coal were sold as smokeless fuel. In saying this I do not want to be labelled a reactionary. I believe that we must take advantage of all scientific inventions and discoveries to seel our coal in the way that would give the greatest satisfaction to the consumer, and at the same time to extract from it all the good that can be extracted."

In the discussion on this paper Mr. John Roberts said that he was pleased to hear from Mr. Burrows that there was no antagonism between the coal industry and low-temperature carbonization. He could realize that difficulties were likely to arise, especially in view of the fact that most of the low-temperature processes, so far, had been designed for the use of the cheaper grades of coal, because there was not a very great margin of profit within which to make these processes profitable. It was suggested that the gas industry was buying coal too cheaply, and it would be useful to consider what that meant. The gas engineer carried out research in order to devise ways and means of making cheap gas from an inferior grade of coal, and surely he and those contributed to that research were entitled to get some benefit from it.

Mr. R. D. Hardy, speaking with regard to balancing of different classes of coke—and he appreciated that very often a difficulty arose through excess stocks in certain classes—suggested that the coal industry was closing its eyes to certain economic facts. Something like £40,000,000 worth of oil was to-day being sent up the chimney. They were facing this problem in Germany, and we would have to face it in this country sooner or later. Therefore, why not tackle it at once. Would the coal industry allow that wonderful new industry that was springing up—namely, the oil industry—to slip through its fingers like it did the gas industry and the electricity supply industry? Somebody had to deal with the production of oil from coal, and why should not the colliery industry take it into its own hands?

"Sell" Smokeless Fuels.

Mr. John Charrington, Jr., speaking on the problems which face a modern coal retailer said: "Smoke is one of the greatest enemies of the coal trade, and whatever our personal views may be upon the anti-smoke propaganda, smokeless fuels, and the merits of the open coal fire, we cannot shut our eyes to the growth of public opinion and to the possible future trend of legislation upon the question of domestic smoke. In my opinion, the retail merchant will be well advised to study and to understand the merits of the various smokeless fuels on the market; to make their advantages known to his customers, and, in short, to "sell" smokeless fuels rather than to be content to book orders for them.

"The Coal Utilisation Council have recently decided to finance, to a considerable extent, research into the question of burning bituminous coal in the open grate without smoke, and I think every merchant will regard this as a splendid move. Whether success can be achieved or not is another matter, but with expert assistance available, it would surely be wrong to leave any stone unturned to find a way of enabling the householder to continue to enjoy his coal fire, if we believe, as I am forced to, that unlimited domestic smoke may not be permitted very much longer."

The Coal Fire—The Case For.

Mr. Kenneth Hargreaves, speaking on the domestic point of view in a discussion on modern ways of burning

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solid fuel, summed up the advantages of the coal fire as follows :

(a) Economy as compared with all other forms of heating, except central heating, for periods of over one hour.

(b) Variations in temperature which are, according to high authority, " physiologically stimulating."

(c) Better ventilation than with any other form of heating or combined system of heating and ventilation yet designed for the home.

(d) According to Dr. Marie Stopes, the coal fire gives out rays which have in them something which is absent from those given out by other forms of heating. This view is disputed by certain other authorities, but is supported by deep-rooted public belief. In Dr. Stopes's view, the old phrase " coal is bottled sunshine " contains a profound truth.

(e) There is a cheerfulness, a " friendliness " and a sense of life and comfort about an open coal fire which is irreplaceable.

(f) Modern grates are beautiful in colour and design, and are produced in a wide range of artistic colouring.

" In response to public demand for cleanliness," continued Mr. Hargreaves, " great strides have been made in the manufacture of low-temperature cokes. These find a ready sale as they burn practically without smoke, give good heat and ignite easily. The future of low-temperaure carbonization should be watched by the coal trade with sympathy and interest. The price difficulty may solve itself as the public will pay a good price for an article when convinced of its merits. The ash problem is difficult, but should not perhaps be beyond the skill of modern scientists.

" Under the heading of smokeless fuel come also high temperature cokes, Welsh smokeless coals (semi-bituminous), anthracites and patent fuels. These can rarely be used in ordinary open grates unless mixed with bituminous coal, but can be utilized with great success in the numerous appliances designed for cooking and heating.

" Coke-burning grates are rapidly becoming popular and require a walnut-sized high temperature coke, or a good smokeless fuel. There is little labour attached as these fires are usually ignited by gas. The cost should not exceed 6d. for 12 hours burning."

In the discussion on this paper Prof. W. H. McMillan, speaking of the question of smoke abatement, asked if makers of coal-burning stoves had ever tried the use of a catalyst in order to reduce smoke from the domestic fire. At the present time he had in his office a fire in which there was a copper bar hinged above the fire. When the fire became red hot this copper bar also became very hot, and from the experiments he had made there was definitely less smoke when using this device.

Mr. J. G. D. Watts disagreed with the author that Welsh smokeless coals cannot be used satisfactorily in the open grate. Cardiff, he claimed, was essentially a smokeless city, and large quantities of Welsh smokeless coals were burned in open grates.

Mr. G. N. B. Huskinson, director of a colliery company, averred that smoke was not so serious for health as often contended, and that a deposit of soot was good for agricultural land.

Not a Very Big One.

Mr. K. A. Cleland said that a great deal had been heard about smoke abatement, but, after all, the Smoke Abatement Society was not a very big organization. The total subscriptions in 1934 amounted to only £874, and an analysis of the figures showed that the gas companies, the gas associations, local councils owning gas and electricity works, and coke manufacturers subscribed £409 of this amount. The electricity supply companies and associations subscribed £110, appliance manufacturers all interested in the gas industry subscribed £45, making a toal of £565, or nearly two-thirds of the total. Charitable local authorities subscribed £25, there was an anonymous subscription of £20, and private subscribers—probably from people interested—amounted to £213. Therefore, he did not think they need take the Smoke Abatement Society very seriously.

Lecture Course at Bolton.

A new course of lectures and demonstrations on boiler-house efficiency and smoke abatement has been arranged, by the Education Committee, for Bolton. The first of the twelve lectures was held on January 29th in the Technical College.

A Country Doctor's Views.

In the course of a letter to the *Yorkshire Evening Post*, commenting upon an article by Dr. W. R. Inge, a medical man practising in a rural area wrote :

" One thing, and one thing alone, prevents us having a death-rate at least one-third lower than that of any other country, and that, as Dr. Inge reminds us in a country with a population of 750 to the square mile. I refer to that foul, man-made thing, smoke, which blots the sun from our great industrial cities, breeding anaemia, rickets, and tuberculosis. Chronic bronchitis is almost unknown in country districts, asthma is much less prevalent than in towns, and tubercular cases of course, are sent to the country as soon as possible. Respiratory diseases will become a rarity when man has the common-sense to insist on breathing air unadulterated with soot, tar, and sulphuric acid."

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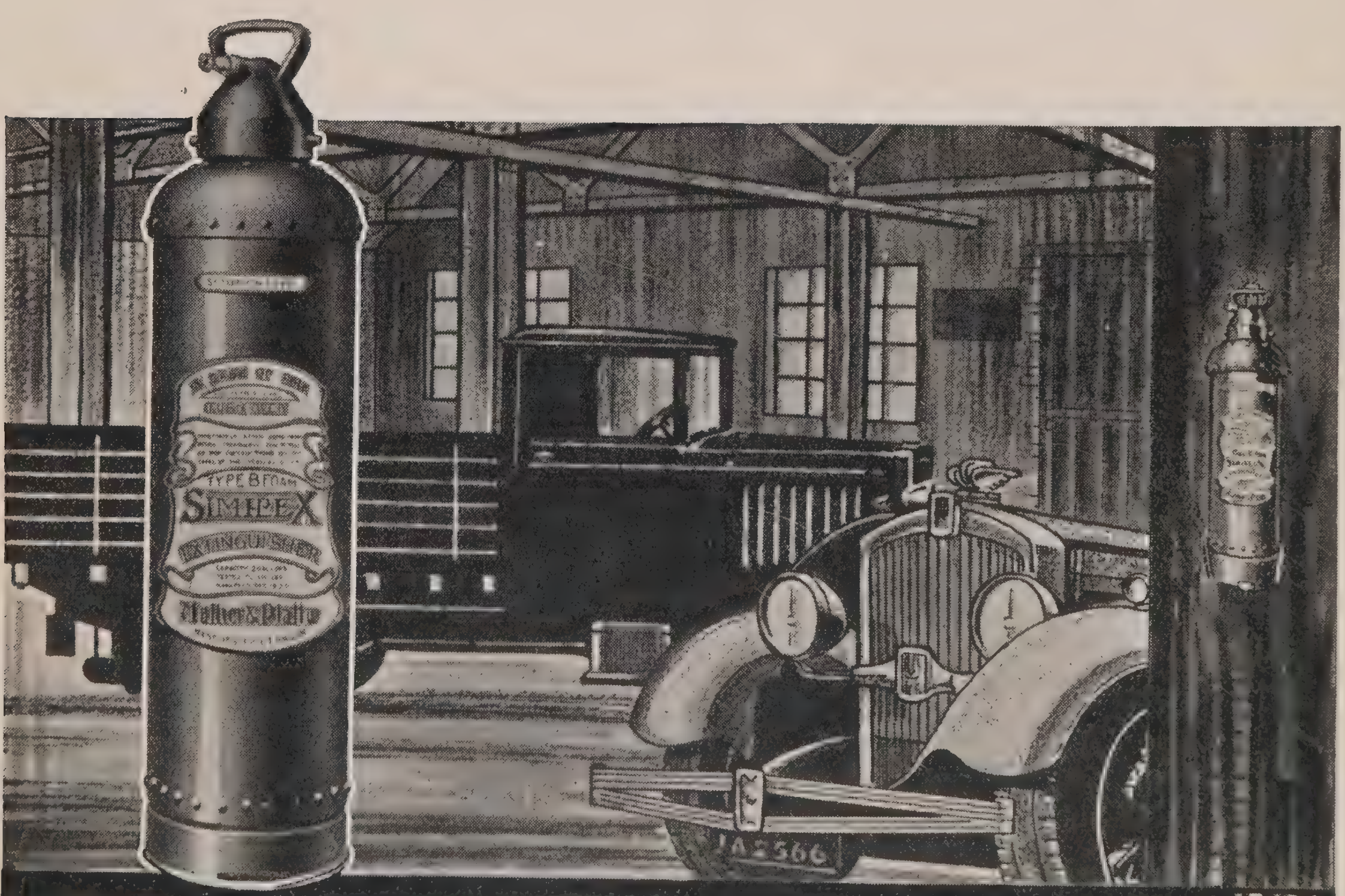

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COAL, POWER AND SMOKE *

BY SIR FRANK EDWARD SMITH, K.C.B., C.B.E., D.Sc., LL.D., Sec.R.S.

Introduction.

The words " Coal, Power and Smoke," which I have chosen as the title of this address, epitomize the industrial history of this country. They conjure to our minds also one of the most important of the industrial problems which face the nation, for the way in which we tackle this problem will affect in no small measure the industrial position Great Britain will hold among the nations in the future. Coal is the one natural raw material available to us in great quantity, or even vast quantities as measured by the scale upon which modern industry draws upon its raw materials. The winning of it has been and still is one of our greatest national industries, and its utilization as a source of energy supplies the life blood of most of British industry. It is one of the marvels of the world in which we live that millions of years ago, long before the first man was born, the decayed stems, branches and leaves of vegetation of these islands should have been deposited regularly, in layer after layer, often with the admixture of only the smallest traces of inorganic impurities, to form our coal seams, but on the material resulting from these processes of nature, Britain's industrial revolution was based. Equally remarkable is it that Britain's industrial position, thus founded upon the use of decayed vegetation should to-day be assailed in some special directions by oil products, the crude source of which was possible produced by the decay of masses of fish millions upon millions of years ago.

The picture I propose to put before you is not a simple outline; indeed, it is very complex, and the predominant tints are drab or rosy according to the spectacles through which it is viewed, for while no doubt miner and mine owner see all of the picture at times, their attention is in general riveted to one particular part. In the first place, I shall give you fleeting glimpses of the coal problem as seen by the miner, the mine owner, the man-in-the-street (in the collective sense, as representing the nation), by the engineer and by the scientist. Then I shall endeavour to give you some idea of the great problem of " what is coal? " I shall tell you also how coal is graded for many purposes and how it is converted into oil, then a few words about the great advance made in the efficient use of coal in recent years, and finally a few words about that great nuisance, smoke.

The Miner's View.

Obviously the miner does not look upon coal through the spectacles of the mine owner or through those of an engineer. The winning of coal is, to him, a daily task; one without sunshine or even daylight to help him, and so hazardous is his task that about one in every thousand of his kind is killed every year. He looks at the total of 999 killed underground in 1934; of whom 296 were killed by explosions and 441 by falls of ground. How few I wonder realise that accidents in the normal work of a mine cause so many more deaths than explosions? Science can help and is helping to make the miner's occupation safer, as it did when Davy introduced the safety lamp, and it is well to record the discovery made by the late Sir William Garforth that an admixture of 50 per cent. of inert dust, such as finely ground shale, to coal dust prevents dust explosions. This discovery has done much to increase the safety in mines.

But the picture of coal as seen by the miner is associated in the main with the following figures :—

In 1913, 1,104,406 miners were employed in this country; in 1934 the number had dropped to 784,773, a reduction of nearly 320,000 men.

In 1913, there were 2,895 coal cutting machines in use and the output of coal obtained by machinery was 24.4 million tons; in 1934, there were 7,406 machines in use and the machine-cut coal totalled 103.7 million tons.

In 1923, the output per man shift was 17.8 cwt.; in 1934, it was 22.9 cwt.

The picture to the miner is a very drab one. He is one of a community wholly dependent on one form of industrial activity, for in the mining areas there is practically no form of alternative occupation. The area in which he works has become, in some cases, a depressed area, for the shadow of unemployment is often over him.

The Mine Owner's View.

Through the spectacles of the mine owner, the predominant part of the picture is that of decreased demand and decreased profits. A diminution of output of 66 million tons since 1913 is most disquieting to him. As he looks back on coal pictures of the past he sees Great Britain as the largest coal-exporting country of the world. This was largely due to the high quality and to the many varieties of our coal, to its accessibility and to the proximity of the coalfields to our seaports, as well as the fact that we developed our coalfields at

---

*Extracts from the presidential address to the Junior Institution of Engineers, delivered on 13th December, 1935.

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a much earlier date than other nations did theirs. In 1913, we exported 73 million tons and 21 million tons were used for bunkers, a total of 94 million tons. In 1934, this total had dropped to 53 million tons, a fall of nearly 44 per cent. The mine owner looks with some alarm at the inroads of oil, especially for marine purposes, and he knows only too well that war conditions led other countries to use more oil and to develop, where possible, their own coal resources and their water power. But it is an interesting fact that so far, the development of hydro-electric power schemes has had little effect on the aggregate amount of coal actually used in the various countries where such development has taken place. In Italy, Switzerland, Norway, Sweden and Canada, coal consumption has remained practically constant.

The Engineer's View.

The engineer looks at his contribution to the coal picture with a certain amount of pride. In the mine each pound of coal is the equivalent of about 14,000 British thermal units, or 11 million foot-pounds of latent energy, sufficient to raise 31 tons of water from the bottom of Niagara Falls to the top ; or, to give another example, 15 lb. of coal contain sufficient latent energy to raise the 73,000 tons of that great ship " The Queen Mary " 1 ft. Indeed, coal is energy in a very concentrated form, and it is of interest to note that when energy has to be transferred over long distances the cheapest form of transmission in this country is in the form of coal in trucks on the roads, on the railway and in ships. The engineer looking at coal realizes that, as an industrial country, we must use our coal efficiently, whether it be for steam-raising, for gas-making or for the manufacture of motor spirit, and the thermal balance sheets prepared by him are a continual incentive to make processes more and more efficient. It has been calculated that of the energy latent in coal as it lies in the mine something between 2 per cent. and 60 per cent. may be expended in various processes of treatment preceding the use of the fuel in its big transformation into kinetic energy as high pressure steam or high pressure products of combustion in the interal combustion engine. It is stated that petrol may be obtained from coal with a thermal efficiency of 40 per cent., but in the internal combustion engine using petrol derived from coal the loss of energy in all the processes from coal to work is nearly 90 per cent. The engineer looks with pride on that part of the picture representing energy from coal for he has done much to increase the efficiency of converting the latent energy of coal into useful kinetic energy. Such figures as the following may appear sad reading to the coal producer, but to the engineer they mean avoidance of waste.

Weight of coal needed for production of 1 million units of electricity.

1923	1,083 tons.
1934	661 „

The Man-in-the-Street's View.

The man-in-the-street, looking at the picture of coal through his glasses, is well pleased to see that we have in this country not less than 100 thousand million tons of coal in many and good varieties. The export of tens of millions of tons every year pleases him, for it enables him to pay for some of the food he must import in order to live, but a fall in that export trade of over 30 million tons and a fall of nearly 10 million tons in bunker coal naturally causes him much concern.

Prominently in the picture he sees the big social questions of wages, of wage agreements and new selling organizations. As wages represent more than two-thirds of the cost of production, they have an important bearing on the competitive place of our coal in the markets of the world, and he can but hope that the deep rooted mistrust of motive which has been in evidence in the past will rapidly disappear, and satisfactory and lasting agreements be reached.

Lastly, he sees what others have missed—smoke. In some industrial towns there is a saying that more smoke means more work, and the man-in-the-street wonders, if smoke were prohibited, whether the nation would, on balance, benefit.

The Scientist's View.

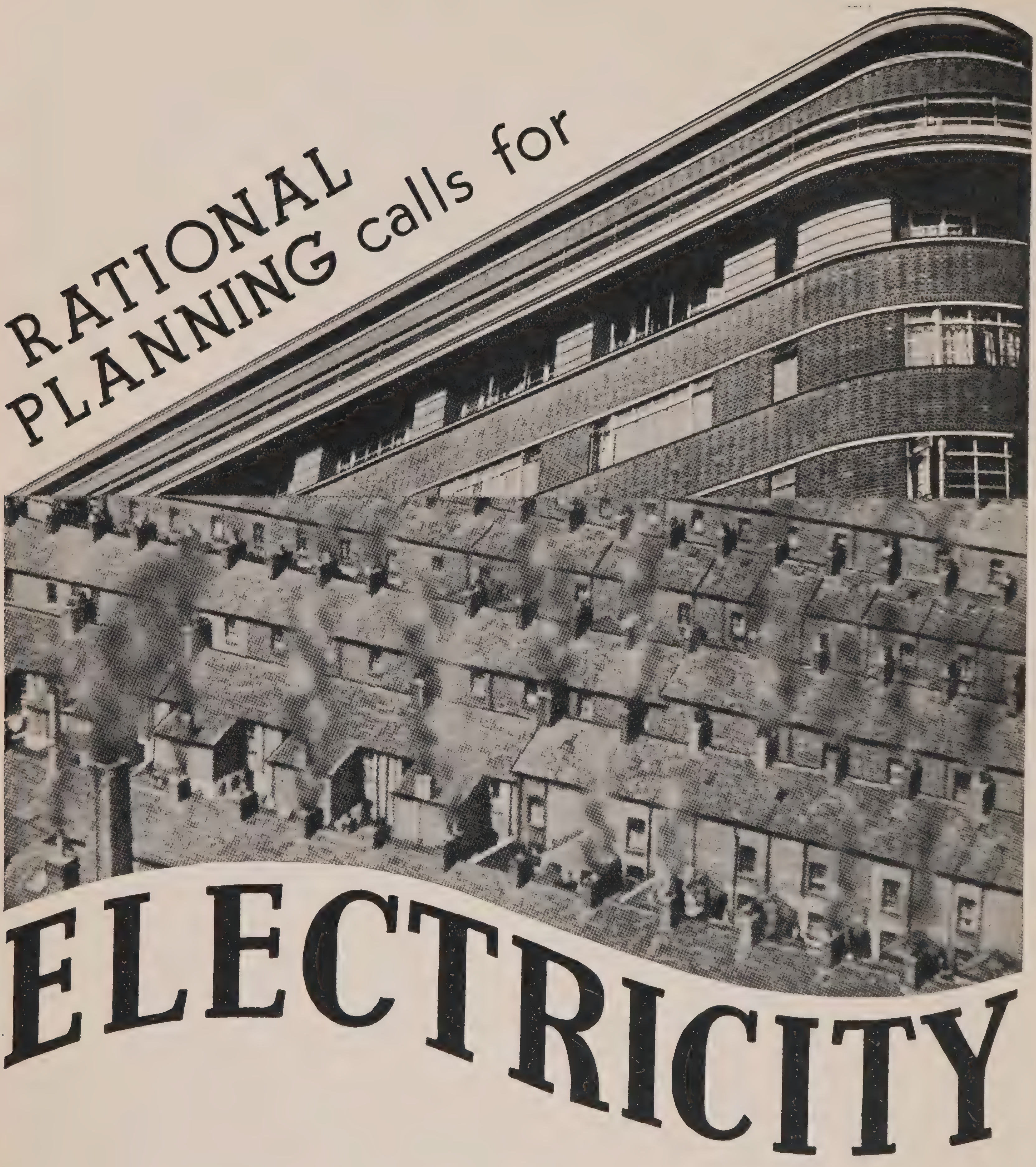
Lastly, the scientist looks at the picture of coal through his glasses. He has gazed on it on and off for the last 700 years without seeing it until recently as an interesting organic substance. His remarks are the briefest of all. He says, " I am sure it is a wonderful substance, and we ought to make far more use of it than we do at present, but what is it ? "

Electric Power and Coal Consumption.

I will now turn once more to the general picture of coal, and more particularly to that portion of it contributed by the power engineer, who burns coal to produce gas and electricity and steam power for our homes and factories and railways.

The demand for British coal is divisible into two portions, that for abroad and that for our own consumption, and the latter may be further divided into industrial needs and the needs of the domestic fire. The home consumption of coal in 1913 was 183.8 million tons, and in 1934 161.5 million tons, a decrease of 22.3 million tons. But this decrease in home consumption is by no means an indication that industry is using less power ; the decrease is due to what is commonly called fuel economy, but which I prefer to call increased efficiency in transforming the latent energy of coal into useful kinetic energy.

The best illustration of increased efficiency, because it can be worked out with great exactitude, is the production of electric power. In 1920, 7,360,000 tons of coal were employed for the production of 5,167



Smokeless power, fumeless heat, flameless light. Cleaner cities, healthier cities, happier people. The day is coming when we shall see all industrial and domestic labour transformed by electrical means.

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million units of electricity, an average of 1,424 tons per million units. In 1934, 11,170,000 tons were used for a production of 16,896 million units, an average of 661 tons per million units, that is, less than half the amount per unit used in 1920. This increase in efficiency is perhaps more striking if I put it in a slightly different way and say that had the engineer produced no improvement in method since 1920, the production of the electricity used in 1934 would have needed 24,060,000 tons of coal, or 12,890,000 tons of coal more than were in fact required.

There is, however, still room for improvement, and fifty years hence electrical engineers may smile at our pride in having attained a thermal efficiency of 29 per cent., for even though it is a great achievement, that is all we have so far attained.

As the man in the street looks at this part of the picture, he is naturally pleased, for it means more power is available or, as I put it in my Gustave Canet lecture, more mechanical slaves with no increase in cost. But to the miner and mine owner it represents an annual saving of nearly 13 million tons of coal and the labour of 46,000 men.

Gas and Iron and Steel Industries and Coal

Apart from the electrical undertakings, the great industrial users of coal in this country are the gas manufacturers, the iron and steel companies with the associated coke oven companies, and the railways.

The production of gas and the making of coke for metallurgical purposes are processes for the destructive distillation of coal, and the products are coke, gas, tar and ammonia. Similar products are obtained from the low temperature distillation of coal, the main product, a low temperature coke, being used as a smokeless fuel for domestic purposes.

From our brief consideration of the structure of coal, it follows that the nature of the distillates and the properties of the residual coke must vary with the nature of the raw coal, the temperature of distillation and any changes in the general procedure of distillation. With increase of temperature the volume of liberated gas increases, but the constitution of the gases varies with the temperature of distillation, and the calorific value per cubic foot diminishes with increase of temperature.

The liquid distillates also vary greatly with the variety of coal carbonized and the temperature of distillation. As may well be imagined from the complex nature of coal, the distillates are by no means simple bodies, and the variety of the constituents is amazing.

As with the other industries I have touched upon, so too in the gas industry there have been marked changes during the past twenty-five years ; changes which have led to increased efficiency and a marked reduction in the coal needed per cubic foot of gas produced. In 1910 the authorized gas undertakings in Great Britain produced 178,000 million cu. ft. of gas, and 15.1 million tons of coal were used ; in 1934 the production was 295,300 million cu. ft., using 17.1 million tons. From these figures it will be seen that over 40 per cent. more gas is being produced per ton of coal to-day than was produced in 1910. The thermal value per cubic foot is not constant, nor have I given consideration to the large volume of gas now produced by coke ovens, but there is little doubt that if the circumstances of to-day were the same as those of 1910, an increased use of about 8 million tons of coal would be needed for the present output.

Iron and Steel and Coal Saving.

The demands on the coke oven industry rise and fall with the demands on the iron and steel industry and the coal distilled by the former may be regarded as being consumed by the latter. The average annual consumption of coal in the iron and steel industry during 1922—3—4 was 22.5 million tons, and during the three years 1932—3—4— it was 10.7 million tons. The production of cast iron and steel averaged 14.1 million tons in the former period and 11.6 million in the latter, but the propertion of steel was less in 1932—3—4. An increase in efficiency is, however, obvious, and the British Iron and Steel Federation claim that compared with 1923, largely from the application of the results of research, £4,500,000 is saved per annum in the cost of fuel. If the coal used by the iron and steel industry costs 15s. per ton, £4,500,000 represents a saving of about 6 million tons of coal per annum.

Sad as is the immediate effect on the coal industry, the decreased consumption of coal through its better utilisation must be welcomed. If it were checked, the industrial productivity of the nation would also be checked. Preventable waste is always bad economics, and must finally be a hindrance to progress, whereas better utilisation leads in the end to an increase of demand. This applies to coal as much as to any other material.

Smoke.

When looking at the general picture of coal through the glasses of various types of individuals, I did not invite the foreigner to express his views. Had I done so, he would have seen, as he always does, the smoky atmosphere of our industrial towns and their suburbs. Such an appearance is by no means new. The nuisance of smoke produced by the imperfect combustion of coal was realised as early as the fourteenth century, when a Royal Proclamation was issued forbidding the use of coal in London, and again in Queen Elizabeth's reign, when the burning of coals in London was prohibited while Parliament was sitting. Much more interesting to engineers is the action of the directors of the Liverpool and Manchester Railway, who in 1829 offered a premium of £500 for the most improved locomotive, the first condition imposed being—

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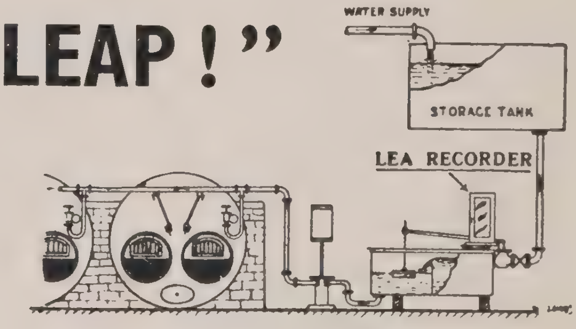

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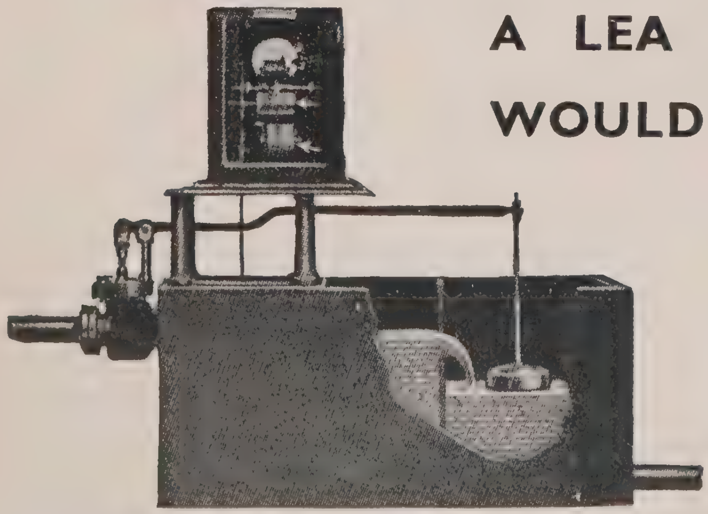

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> "The said engine must 'effectively consume its own smoke' according to the provisions of the Railway Act, 7th Geo. IV."

In the combustion of coal, the combination of the carbon and hydrogen of the coal with the oxygen of the air passes through a number of intermediate stages before products like CO_2 and H_2O are formed. Provided that there is sufficient excess of oxygen present during the combustion process, the combustion is relatively complete, and little or no smoke is produced. In the case of a piece of bituminous coal, combustion proceeds on the surface, the under layers being raised in temperature and at first carbonized, as in a retort. The volatile matter escapes, and the amount of oxygen present and the temperature conditions determine whether there is complete combustion. In the general case a portion of the tarry vapours escapes unburned or partly burned, and other portions are decomposed or "cracked" with carbon as a residue, and this latter escapes as soot. In addition to smoke, ash and oxides of sulphur are emitted from chimneys, and the effect of these latter is by no means negligible.

In 1934 we mined nearly 221 million tons of coal, exported 40 millions, supplied 13.5 millions for foreign bunkers and consumed over 150 millions at home. Some of this 150 millions was burnt with the production of little smoke, but the major part of its was burnt so as to pollute our atmosphere with soot, tarry matter and sulphur dioxide. In a recent paper by Dr. Lessing, it is stated that over 19 million tons of coal were brought into London last year, and the bulk of this was consumed in Greater London. Assuming the sulphur content of this coal to be as low as 1 per cent., about half a million tons of sulphuric acid would result from its oxidation and combination with moisture, and the acid fumes would be discharged into the atmosphere of Greater London. However, in certain industrial areas sulphur removal is practised, and this may reduce the total sulphur figure by 20 per cent., leaving a liberation of about 1,000 tons of sulphuric acid into the atmosphere of Greater London every day.

The effects of smoke and grit and acids on health, loss of daylight, damage of buildings and on vegetation are very serious, and whilst reliable estimates are exceedingly difficult to obtain, those collected are of great interest.

Health.

In an interim report, the Newton Committee, which made its final report to the Minister of Health in 1921, recorded that "the number of deaths from pulmonary and cardiac diseases is shown to increase in direct proportion to increased intensity and duration of smoke fogs." Apropos of this relationship, the Spring (1934) number of the Journal of the National Smoke Abatement Society states :—"There were nine days of fog in Manchester in January, 1931. Deaths from respiratory diseases were 365, compared with 94 the previous December. During the actual week of fog, 130 died from respiratory diseases compared with the weekly average throughout the year of 20." It is true that there may be some doubt whether full weight should be attached to such figures, but that smoke fogs bring about an increased death rate from respiratory diseases is not, I believe, generally questioned.

Apart from these more obvious effects on health, smoky atmospheres also affect health by absorbing all the ultra-violet rays of sunshine and of skyshine. It is true that under the best conditions in this country, the amount of ultra-violet radiations reaching the earth's surface is relatively small when compared with that in tropical countries, but small as it is, it may be of great value in promoting calcification of bones and teeth of people, especially of children, upon whose skin it falls. It seems that in and near a great industrial town under present conditions of life there are no ultra-violet rays at all.

Light and Cleaning.

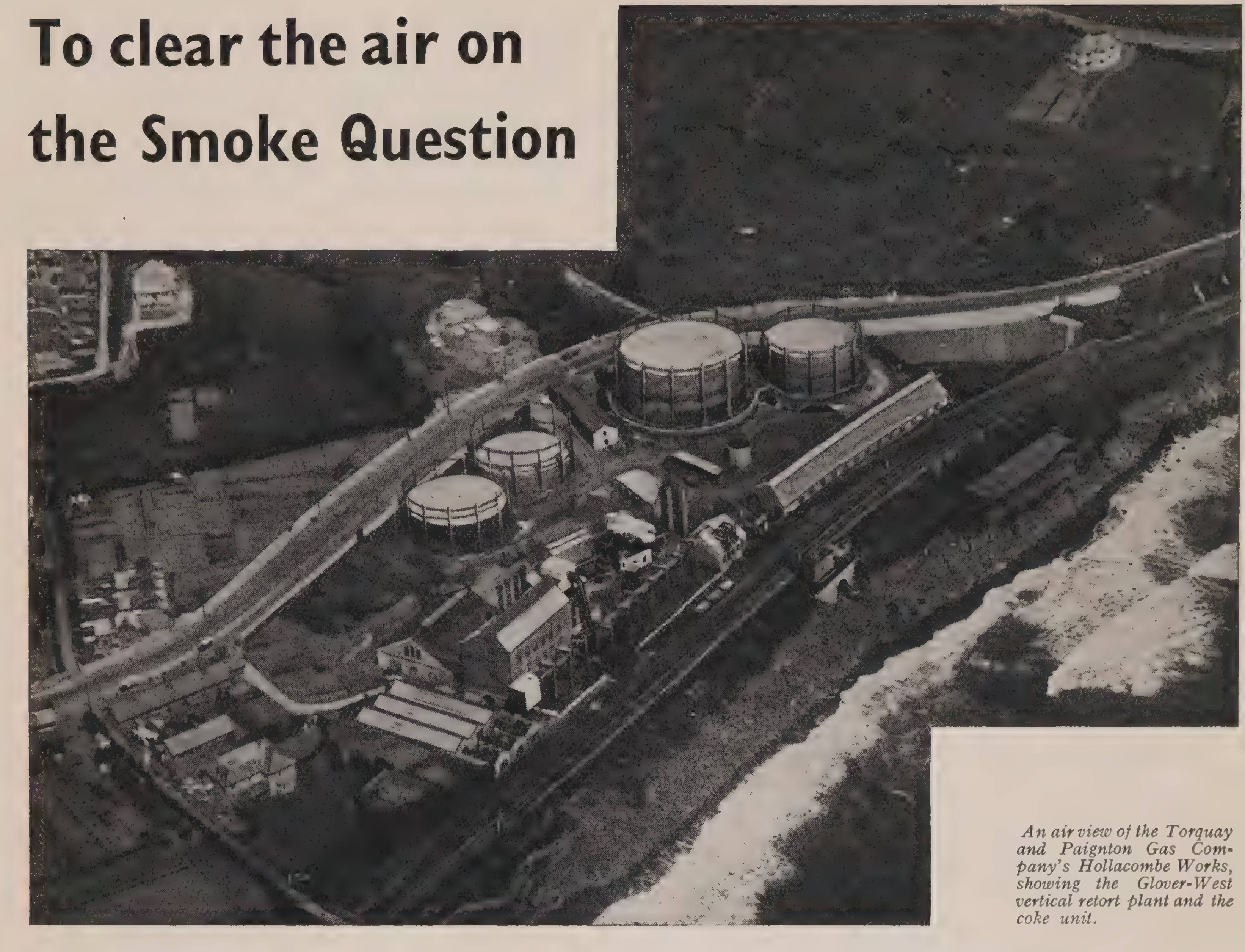
There are ample data with regard to loss of daylight caused by smoke. For example, in a comparison of daylight figures obtained at two centres in Halifax during the year April, 1931—March, 1932, it was found that the more heavily polluted centre received 20 per cent. less light than the other, the loss being greater in the winter months, and amounting in December, 1931, to nearly 50 per cent. Similar figures, though not so striking, were obtained at the same centres in the following year. It is, however, far too difficult to give an estimate of the increased cost of artificial illumination, but for the whole country it must run into hundreds of thousands of pounds. The monetary value of soot poured into our atmosphere every year was estimated by the Newton Committee : its final report states, "The waste of fuel alone is a very serious consideration. It is estimated that approximately 2½ million tons of potential fuel in the form of soot escape annually into the atmosphere from domestic fireplaces and 800,000 tons from industrial chimneys. At £2 a ton this represents an annual and direct waste of £6,000,000."

The cost of cleaning laundered and other goods is much increased. In 1918, the Manchester Air Pollution Advisory Board estimated that if the air of Manchester were as pure as that of Harrogate, the cost of household washing in Manchester would be reduced by something like £250,000 per annum.

Buildings.

The smoke and sulphuric acid also affect buildings, and signs of premature decay of public and other buildings thus attacked are not uncommon in most towns. The following estimates of the additional cost of maintaining buildings are due to the late Sir Frank Baines :—

To clear the air on the Smoke Question



An air view of the Torquay and Paignton Gas Company's Hollacombe Works, showing the Glover-West vertical retort plant and the coke unit.

Prior to the formal opening of magnificent modern gas showrooms at Torquay, Major R. P. Kitson, J.P., C.A., Chairman of of Directors of the Torquay and Paignton Gas Company said :—

> **" I think we are all agreed that the total abolition of smoke is a consummation devoutly to be wished. In all parts of the country atmospheric pollution is serious, but in a district like this, where we claim the manufacture of health as our industry, the importance of a clean atmosphere cannot be overstated. The gas industry to-day offers a service whose universal adoption would provide the solution to this grave problem, and, at the same time, utilize the natural wealth of the country to the fullest advantage."**

Torquay's gas and smokeless solid fuel is produced by smoke-free methods in totally enclosed Glover-West vertical retorts and a coke unit of West design and construction. The Gas Administrators of many other famous health resorts have similarly modernized their works, and their adoption of the West systems of manufacture has enhanced the claim of the Gas Undertaking to be the community's principal weapon against atmospheric pollution.

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(1) That at the very least £120,000 per annum could be saved (representing a saving of 30 to 40 per cent.) upon the maintenance of official buildings in the charge of H.M. Office of Works, if the air were as pure and clean in towns as it is in the rural districts ;

(2) That the excess cost due to making good the results of atmospheric impurity to buildings for the whole of the country could be placed at a minimum figure of £55,000,000 to £60,000,000 over a period of twenty-five years.

Damage to metal work, fabrics and merchandise in general are additional items, and cannot be ignored for any complete assessment of the cost of the smoke nuisance. It is obviously impossible to give any close estimate of the total cost, but some attempts have been made with results which, though widely varying, serve to emphasise the large sums involved. For example, a calculation made for Pittsburg in 1912 indicated that the assessable losses due to smoke pollution (including waste of fuel, cleaning charges, artificial light bills, etc.) amounted to $20 per head of population. A similar estimate made in 1918 in Manchester led to a figure of £1 per head of population. Obermeyer, in his book "Stop that Smoke," estimates the annual bill for smoke in the United States to be in the neighbourhood of 500 million dollars, of which 140 million dollars represent the cost of spoiled merchandise and the cleaning of buildings.

The Remedy.

We cannot look upon smoke but as an evil which, in the interests of the community as a whole, should be abolished. In their interim report, the Newton Committee suggest that the domestic chimney is responsible for at least half of the pollution. That this estimate is conservative is suggested by measurements by Dr. J. S. Owens, who found that in London the pollution consisted roughly of 2½ parts domestic and 1 part industrial smoke, and in Glasgow, 3½ parts domestic and 1 industrial. It appears, therefore, that greatest progress is to be expected by an attempt to limit domestic pollution, especially as the pollution from the average domestic chimney, containing, as it does a larger proportion of tarry matter, is the more injurious.

Industrial plants, in some cases no doubt because of a present-day appreciation of the waste due to incomplete combustion of fuel, offend far less now than formerly. At the Battersea Power Station smoke is absolutely prevented and sulphur pollution is reduced to a negligible amount. Maybe the station would be even more efficient in terms of coal per unit output of electricity if it did not clean its flue gases. I do not know. At present, however, there is no more efficient power station in the world. And what Battersea can do, other large power stations and large industrial units can also do.

With regard to the domestic fire, the obvious remedy is to devise grates that will burn coal more efficiently, or to substitute smokeless fuels such as low temperature coke, gas coke, anthracite, gas or electricity. The path to our smokeless goal is not, however, an easy one. But when we realise the damage done to health and property, it does at least seem worth while to endeavour to reach the goal in our own lifetime.

Conclusion.

Having surveyed from various aspects the more interesting portions of the picture painted by the old and modern masters of coal, it is of interest to ask, what will be added to the picture in the future ?

To me it appears certain that industry will not only continue to burn coal, but will strive and succeed in burning it much more efficiently than is done to-day. This means less coal per unit of output, but such output should be larger, and the benefit to the community should be even greater than at present. Because we have vast resources of coal is no good reason why we should waste them.

Science, will I believe, gain increased knowledge of the chemical structure of coal and of the various reactions which ensue when coal, or a part of it, is burnt, volatilised, or dissolved. This will lead to improvements in existing methods of using coal, and will also lead to methods for obtaining products which at present do not exist. The production of liquid fuels should be cheaper, and no doubt lubricating oils will be made. It is well to remember that the motor industry, the aircraft industry, the rayon industry, the radio industry, the artificial nitrates industry and the hydrogenation of coal are all new in our own lifetime—at least they are in mine—and they employ well over a million workers. Why not be optimistic and see in the picture of coal's future the use of de-ashed pulverized coal in internal combustion engines and new industries that science will produce with coal as the raw material ? and one can but hope that at least some of these new industries will find a home in the present depressed areas, and that with such alternative occupation the shadow of unemployment will gradually disappear.

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NEWS AND VIEWS

Thomas Parker.

The late Mr. Thomas Parker, the inventor of the "Coalite" system of low-temperature carbonization, was honoured at a luncheon given by Low Temperature Carbonisation, Ltd., when a gold medallion was presented to his son, Mr. C. H. Parker, a director of the firm, by Dr. H. A. Des Voeux.

Dr. Des Voeux, in his speech, said that he was representing the National Smoke Abatement Society, but that it should not be taken that the Society recommended one method of heating by smokeless mediums in greater degree than another. This was sometimes asserted, but was absolutely untrue. Their business was purely a propagandist one. They preached smokelessness, clean air, and sunshine, and welcomed and kept the ring for all methods that had those objects in view. They were the friends of all and enemies of none.

Dr. Des Voeux sketched the remarkable career of Mr. Parker, who started work at nine years of age in a foundry, without education, for the lordly salary of 2/- a week for 59 hours labour.

"At eighteen," continued the speaker, "he tramped the country in search for work, being driven from one job to another by the Trade Unions which he refused to join. At twenty-six he was back at Coalbrookdale and was appointed manager to the chemical and electrical department, and there he remained until 1881. In 1878 by inventing the electric battery he displaced the bichromate battery, and with this equipped a motor car. He also equipped the Liverpool Overhead electric railway. In 1894 he formed his own company and made an experimental electric train for the Metropolitan Railway, of which company he was later elected a director. For some years his mind was turned to the emission of smoke from chimneys, but it was not until 1904 that his system of low temperature carbonization came, and it is for this that his memory is being honoured to-day.

"At that time he came to see me, and I must confess that knowing nothing of him I was not impressed by his appearance. He was plainly dressed in rough material, of stoutish build, and of very quiet and simple manners: no bounce and no swagger. After a short time when the first impression had worn off one felt certain that one was in the presence of a man of parts, that he had much more knowledge than the vast majority of mankind, and that he was possessed of grit and determination and a great nobility of character. I feel how apt the old saying was, "some men are proud of their descent, here is a man proud of his ascent," for he had raised himself to the rank of the "great ones."

Railway Electrification.

The electrification of the railways has recently been discussed in these pages from the particular point of view of abolishing a material proportion of the smoke nuisance. The question in general deserves the close study of all because of its increasing desirability and importance, and a recently issued pamphlet ("The case for Electrification of the Railways," British Electrical Development Association, pp. 24, 3d.) is to be recommended as an admirable and concise statement of the position. The importance of clean railways, more pleasant travelling, and improved, smoke-free stations, is, of course, mentioned. These points, and the arguments of a technical and economic nature, are clearly and concisely set forth, and can hardly fail to leave the reader keenly hoping that progress on a really big scale may be quickly made.

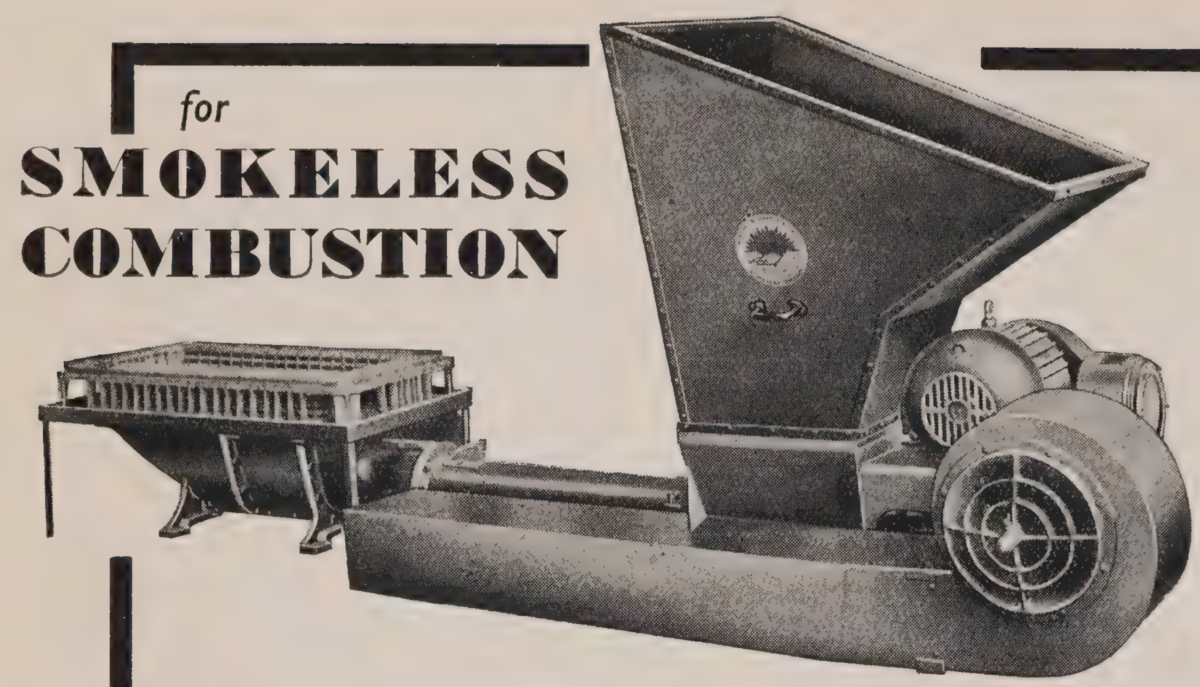
The "News-Chronicle."

We should like to express appreciation to the *News-Chronicle* for two recent articles, both prominently displayed on the centre editorial page. One was a clear, outspoken review on smoke abatement generally by Noel Carrington, and the second, entitled "Fog," was by J. L. Hodson, the novelist. "Imagine," says the latter, "every time we get cold air fighting warm air and no wind and our thousands of chimneys quietly and inexorably polluting the atmosphere a London fog is just about as inevitable as to-morrow's dawn . . . It's an awful blow to me to know that the way out isn't by my fan on a lorry, but by quenching my jolly coal fire."

Lace Curtains and Smoke.

A correspondence on the state of the lace trade in the *Nottingham Guardian* included the following letter:

"I have used lace curtains for over forty years. There is much to be said about the smoke nuisance. In my district, if a woman complains near where there are works, belching forth dirty smoke, she finds all the more another time. I am sure if these people were made to abate the smoke nuisance more lace curtains would be used. Let us have more consideration, and then you will find more lace curtains used."



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THE PHOTOGRAPHIC COMPETITION

A SUCCESSFUL EVENT

The photographic competition organized by the Society, and previously mentioned in the *Journal* resulted in a satisfactory number of entries, from which over thirty were selected for an exhibition that was held during January in the rooms of the Manchester Amateur Photographic Society. The prints were judged by Lady Snowden, Alderman Melland, and Mr. James Shaw. Mr. Shaw is a well-known photographer whose co-operation was valuable. The majority of the entries depicted the emission of smoke in one form or another, and there were very few showing what the prospectus of the competition had suggested—the positive side of the question, indicating cleanliness bright sunshine, and such subjects. Mr. A. E. Powell, of Welwyn Garden City, was an exception, and two of his photographs showing children playing under a flowering almond tree, and a modern smokeless factory, of high pictorial quality, were awarded two of the £1 prizes.

The entry that won the first award is reproduced on the cover of this issue. It is a striking example of smoke at its worst, and in the original possesses high technical qualities that add to its value and helped it to gain the award. It is rare to find a photograph showing such a true rendering of smoke, but Mr. Green's print achieves this in a remarkable way. The suggestion of blue sky and sunlight, shown by the white cumulous cloud behind the smoke, adds considerably to the appeal of the photograph.

The second prize of £5 was awarded to a print entitled "Dawn in the Village," which is a striking picture of domestic smoke besmirching a quiet village at the break of day. The atmosphere in this is again excellently rendered.

The other prizes were awarded for photographs that showed other aspects of industrial and domestic smoke, and to one showing the erosion of stone pillars on a wall in a Rochdale park.

There were many other fine prints which almost secured prizes, some of which will be purchased for use, with the winners, for propaganda and reproduction purposes. They will be available for loan for exhibitions.

The exhibition of the prints created interest in Manchester, chiefly in photographic circles, and was favourably commented upon in the press. Further entries will be reproduced, from time to time, in the *Journal.*

The full list of awards is as follows :

1st Prize (£10) : "Firing Up," by A. H. Green, A.R.P.S. Second Prize, (£5) : "Dawn in the Village," by Samuel Hall. Prizes of £1 : "A Smokeless Factory at Welwyn," and "Where Almond Trees Blossom," by A. E. Powell ; "Obscuring the Sun," by G. R. Hinks ; "Clouds Over Industry," by E. O. Hoppe, "Smoke Screen," by H. E. Norman ; and "Erosion of Pillars, Rochdale," by J. C. Wild.

CORRESPONDENCE

To Mr. Editor,
N.S.A.S. Journal.

Sir :

May I congratulate the National Smoke Abatement Society on the admirable work achieved during the past year ? I have just read the Annual Report for the year 1935-36 and am impressed by the continued and expanding activities of the Society.

I returned to London from abroad to suffer several days of fog almost as bad as those endured by patient Londoners twenty years ago. Patience, we are told, is a virtue, but unintelligent apathy is a social crime. For a week we have had dislocation of traffic, road and rail chaos, involving loss of life, major and minor casualties and infinite discomfort.

While an energetic Transport Minister is using every endeavour to reduce road accidents, a complacent public continues to ignore the excellent smokeless fuels now on the market which would reduce smoke fog by seventy-five per cent.

But there is an even more serious aspect. There is a lesson for us in the threat of oil sanctions against Italy. Let us suppose that some policy adopted by Great Britain were to meet with the disapproval of a group of Powers. Suppose this disapproval were to proceed to the length of sanctions against Britain. Within a month we should be reduced to impotence and humiliation for our oil supplies are ocean borne.

Yet for many years we have had the means to provide ourselves with oil from our own coal measures. Our Defence Service have been quick to recognize this and by purchasing the output of low-temperature carbonization plants they are encouraging an enterprise which will eventually furnish fuel oils and smokeless fuels and thus banish the menace of dependence on foreign oils and at the same time eliminate much of the smoke evil in our great cities.

I am, Sir,
Yours faithfully,
H. G. THWAITES.

THE SMOKE ABATEMENT SHOP

A MANCHESTER EXHIBITION

A highly successful experiment was carried out in Manchester during the first three weeks of December, when a smoke abatement shop exhibition was opened. The exhibition was arranged by the Manchester, Salford, and District Branch of the Society, with help from the national organization. The use of the shop, in property belonging to the Manchester Corporation, was kindly given rent free, and the lighting was carried out by courtesy of the Electricity Department.

The original intention was for a shop-window display, only, perhaps with some literature inside. The size of the interior, however, resulted in the gradual growth of a more imposing exhibition. Two sections were occupied by the Gas and the Electricity Department, and a third section displayed fuels and appliances for the open fire. Samples and particulars of the various smokeless fuels were shown, and a feature was made of the new types of open grates, as well as the domestic boiler and anthracite stove. Electric and gas fires, cookers, and water heaters completed what was an attractive and comprehensive display of the ways and means of achieving the smokeless home.

The window, topped with posters, was devoted to exhibits—photographs, models, charts, and specimens—showing the effects of smoke. The Manchester Public Health Department loaned their interesting exhibition material, and the Parks' Committee loaned a number of shrubs that showed the difference between growth and condition in the city parks and in the countryside.

The exhibition created much attention, for which a great deal was due to the interest taken in it by the excellent Manchester newspapers. Though the shop did not face one of the always-crowded shopping thoroughfares there was rarely a moment when there was not a group of passers-by examining the exhibits in the window, and many hundreds of people came inside to see the rest of the exhibition and to make inquiries. Very many such inquiries, showing a keen desire to do something, were dealt with during the time, and it was recognized that the enterprise was creating far more interest than had been anticipated.

Our thanks are due to all who helped to make this success possible, especially to the members of the Branch who freely gave their services, to the officials of the Corporation departments who did so much in preparing the exhibition, and to the Lady Mayoress who opened it with a gracious and thoughtful speech.

The propaganda value of such exhibitions is clearly considerable. It would be possible to prepare a permanent exhibition that would travel from town to town continuously. There is only one difficulty in doing this—the usual one—namely, that the Society cannot, yet, afford to do it.

Smoke Pollution by Potteries.

It is reported that the Gas and Electricity Committees of the Stoke-on-Trent City Council are considering separate schemes to minimize smoke pollution caused by potteries.

The Gas Committee is to hold a further meeting with representatives of the British Pottery Manufacturers' Federation to discuss the use of gas as a heating medium in potteries.

The Electricity Committee on 30th January, submitted a proposal to the Council that £110 should be paid to Major Bernard Moore, a consultant potter, towards the rent and rates for a year of a special building to be acquired for experimental work in the use of electricity for the firing of kilns containing pottery ware, and that he should be provided with free electrical energy and switchgear. The council referred the proposal back for further consideration.

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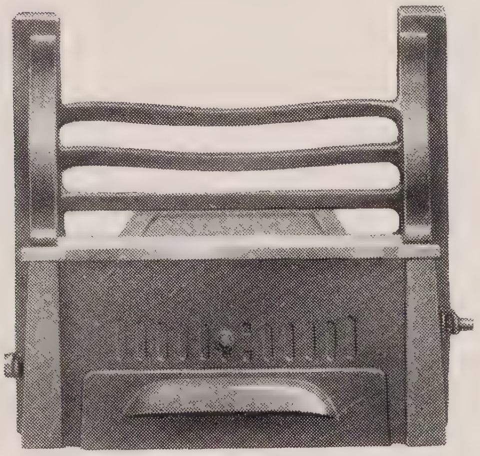

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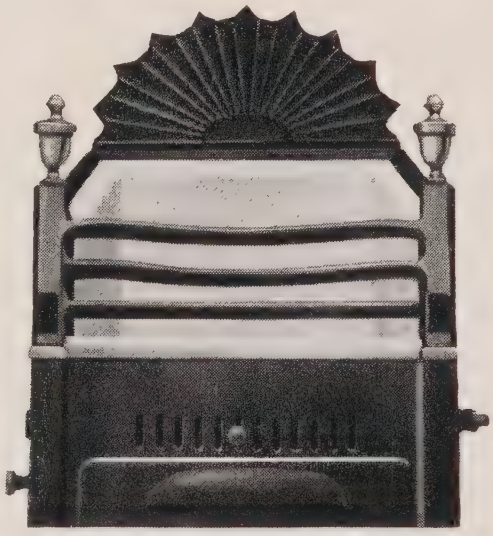

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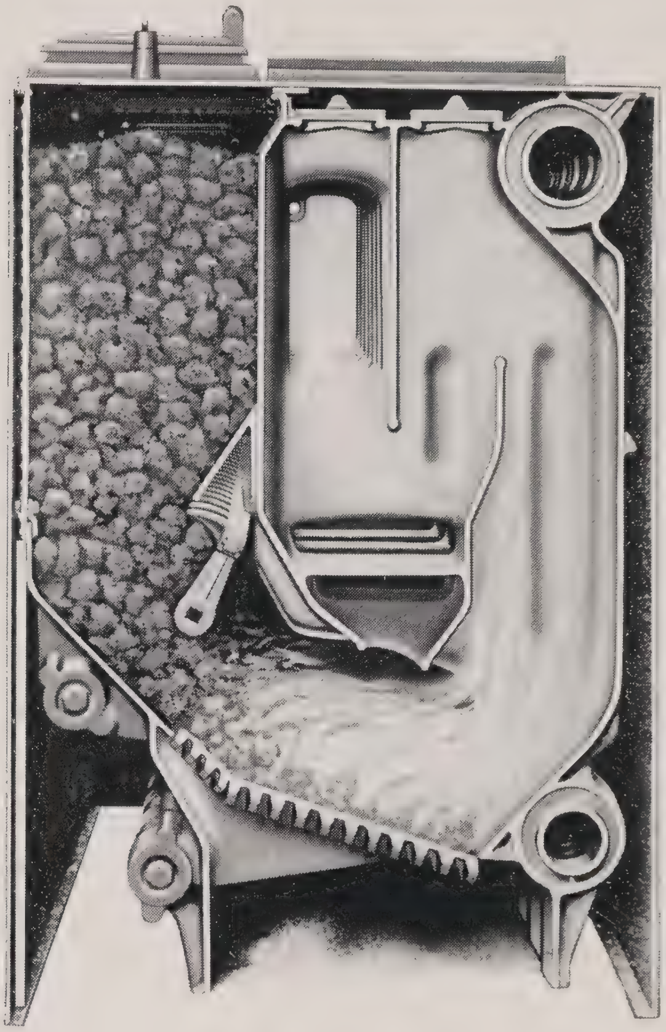

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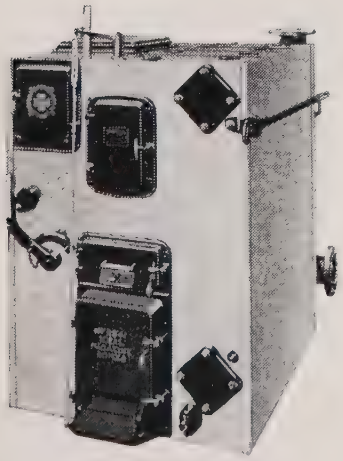

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"A Smokeless Factory at Welwyn Garden City" Competition Award) Photo. by A. E. Powell

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1936

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The Gas Industry—an index to trade recovery

The yearly statistics published by the gas industry are a useful guide to the state of trade in this country. When times are bad and factories are closed down or not working fully, the sales of gas to industry are low, rising as industrial prosperity returns. The marked increase then during the last year in the industrial sales of gas is a reliable pointer to better times ahead. It not only shows which industrial centres have been quickest to shake off the depression of the last few years, but affords evidence too of the movement of trade from one district to another.

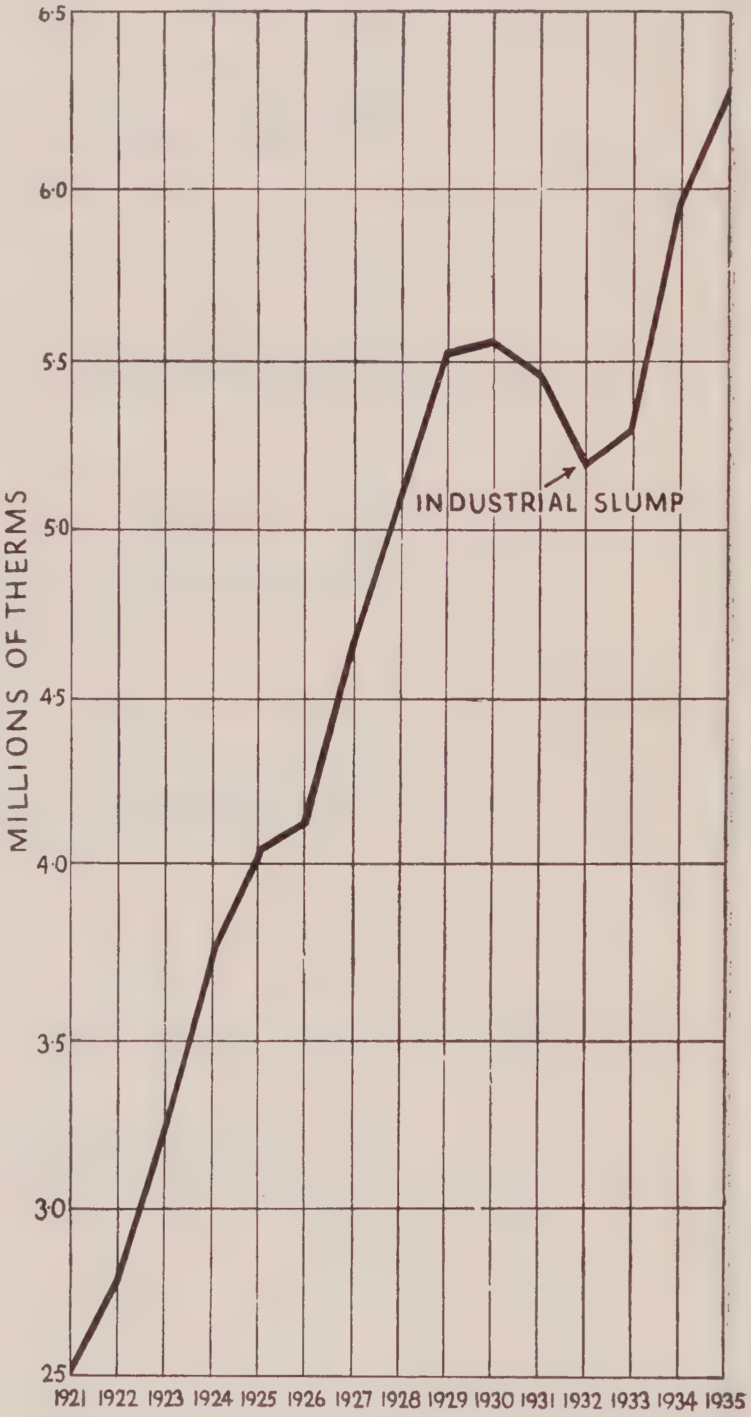
In 1934, for instance, 56 per cent. of the total gas sold in Sheffield was bought for industrial purposes; last year the percentage had risen to no less than 62. Rotherham can show equally striking figures, while increases in the amount of gas taken by industries in almost every important town in Lancashire reflect the healthier condition of that county's trades.

A similar story is told by recent statistics from the busy manufacturing centres in the midlands. Coventry, the home of motor-car manufacture and a huge consumer of gas, shows a rise in the percentage of gas sales to industry during the last two years of from 30 to 35; in Derby the corresponding percentage in 1934 was 28, which rose to 35 in the year that has just closed; Stoke-upon-Trent and the Potteries, West Bromwich, Smethwick, Leicester and Wolverhampton also show that, with increasing prosperity, trades of all kinds turn to the gas industry to supply them with a fuel suitable for modern methods of manufacture. Industries in all these towns bought last year a fifth of more of the total gas sold.

The Move Southwards.

A sharp rise in the industrial sales of many gas undertakings in or near London shows that the trend of industry southwards continues. In the areas covered by the Watford and Maidstone gas undertakings the proportion of sales for industrial purposes last year was approximately double the 1934 figure, rising in the former case from 9 to 17, and in the latter from 8 to 17 per cent. At Slough the percentage has increased from 28 to 32, almost a third of the total annual sales of gas now going to industry; while in London itself, the two largest gas undertakings disposed of almost one-tenth of their total annual sales last year to trades of various kinds, one-fifth of the yearly sales of a third London undertaking now go to industry.

Issued by the British Commercial Gas Association, 28 Grosvenor Gardens, London, S.W. 1.



Increase of gas sold for industrial purposes by one large gas company.

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issue from time to time reprints of technical articles of which the following are typical. Copies of these and others can be obtained on application to the nearest branch office or representative.

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May, 1936.

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The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.

COMMENTARY

THE preparations for the Exhibition at South Kensington are now in full swing, even though there are nearly five months to go before it opens on October 1st. The opening ceremony, we are pleased to be able to announce, will be performed by the Rt. Hon. Sir Kingsley Wood, M.P., Minister of Health.

The Society's Annual Conference will take place during the course of the Exhibition, and will be opened on Wednesday, October 14th, by Captain Harry Crookshank, M.P., Secretary for Mines. It will continue during the Thursday and Friday, and the Annual General Meeting—the business meeting of members—will be held on the morning of Saturday, October 17th. It is yet too early to give full details of the Conference, but it should be of more than usual interest. Broadly speaking, it will be divided into an Industrial Day, a Domestic and General Day, and a Municipal Day. A session on "Light, Smoke and Health" will be of especial importance, to which prominent authorities will make contributions.

The Exhibition itself and the Conference arrangements are the two most important tasks on hand, but preparations are also being made for the publication of an Exhibition Handbook and Catalogue. This will not only contain a descriptive account of the exhibits, but there will be several articles on the chief aspects of the problem which will give it lasting value. There will also be a section of announcements by the manufacturers of smokeless fuels and appliances, together with a classified directory of their products. This latter feature should be a useful reference list for the many people who, we hope, will be stimulated by the exhibition into action.

One of the most interesting and instructive visits made by the Society was the recent (on April 2nd.) inspection of the flue-gas cleaning plant at the Birmingham Power Stations. A meeting of the Council of the Society was held in the morning and was followed by a meeting, presided over by Dr. R. Lessing, at which Mr. F. Forrest, Chief Engineer and Manager of the Birmingham Electric Supply Department, gave an address on the plant that was to be visited in the afternoon. His paper was followed by a full and informative discussion in which a number of members joined. Mr. Forrest went to considerable trouble in writing a detailed paper and we regret that lack of space prevents us from printing it in full in this number of the *Journal.* Rather than abbreviate it however, it will be published verbatim in the next issue, when it will be seen, by those who were not fortunate enough to hear it read, how extensive and thorough have been the steps taken by the Birmingham authorities to overcome a serious dust nuisance. As a speaker in the morning's discussion said, the action of a local authority was an example to private undertakings of what could, and in many cases should, be done.

A cold and wet morning turned into a cold but moderately dry afternoon, and the party, which numbered fifty and included some members of the Midlands Advisory Council for Smoke Abatement (the Regional Committee) went by motor coach first to the power station at Nechells, and then to Hams Hall. At both stations there are centrifugal type grit arrestors which, though efficient for mechanically fired steam boilers, were not nearly so efficient with the very fine dust discharged from the pulverized fuel fired boilers. Electrostatic dust precipitation plant, of the Lodge-Cottrell type, was therefore installed, and the primary purpose of the visit was to inspect these installations. There was, among those who were not engineers, perhaps some little disappointment that the inner workings of the plant could not be seen, but even the most uninitiated could appreciate the visible effects, as shown at the chimney top, of cutting off the plant for a few moments. The vast quantities of sludge collected was further evidence of the nuisance from which the surrounding countryside was being saved.

" The irony of the whole position is that we are smoke abolitionists," wrote a vicar who was recently summoned and fined for allowing his chimney to be on fire. His views are to be commended although it is to be deplored that he should have given to them such little effect. The firing of chimneys is one for which there is simply no excuse, and is caused either by sheer carelessness with a chimney that is in urgent need of cleaning, or, more often than not, it is a deliberate method of cleaning the chimney. Apart from the fact that chimneys only get into the condition which demands such a remedy as a result of using raw coal, there is no need whatsoever for what is perhaps the most objectionable and selfish of all forms of smoke nuisance. And yet, in many districts, it is a general habit that is carried out with regularity. It is a nuisance that is dealt with by the police, but as it is soon over and done with, the chances of it being seen by a policeman are slight and, as the usual fine is small, are considered to be well worth the risk. The times at which there is no policeman in the locality appear, in some places, to be known and to be acted upon. It is true, as the reverend defendant found, that offenders are sometimes summoned and fined, but it is in only a relatively small number of cases, and certainly in too small a number to act as a deterrent. The fact that so many people will deliberately create such a foul and needless nuisance shows how small is the general conciousness of seemly amenity and cleanliness—a degradation of standards due to the ubiquity of the dirt that has its origin in coal smoke.

ATMOSPHERIC POLLUTION 1934-35

THE 21st REPORT OF THE INVESTIGATION

The D.S.I.R. Report on the Investigation of Atmospheric Pollution (H.M. Stationery Office, 5/-) for observations in the year ended 31st March, 1935, was published in February, and received a welcome amount of publicity in the press. The passage most usually quoted is that stating that the figures show a setback when compared with those of the last three years, and the opinion that smoke abatement is not progressing is the natural conclusion of many.

The figures show that there is little or no improvement, and, as the Investigation deals only with pollution and not with its causes, it would be desirable to consider why progress, apparently, is not being made.

Apart from industrial tendencies and the effects of a partial trade revival, it is likely that the most important reason is the same as the one that keeps up the consumption of raw coal for domestic purposes in spite of a rapidly increasing use of smokeless mediums and the increased efficiency of modern ranges and grates, namely, the fact that, although there is undoubtedly less smoke emission per house than formerly, there are a much larger number of houses. From 1921 to 1934, 1,155,093 houses were completed in England and Wales, which is a substantial increase on the 7,811,030 built and occupied in 1921.

The availability of smokeless mediums has, since the war, reduced very considerably the possible smoke emission, but nevertheless there has been, in practically every new house at least one range or grate in which raw coal is being used. The density of pollution near to the point of emission is probably much less than it was twenty years ago, but, as the new report shows, the aggregate deposit, and therefore probably the aggregate emission, is not materially changed.

If this is the case then it is clear that a net improvement in conditions as far as domestic smoke is concerned, cannot take place until (a) new houses erected are completely smokeless, or (b) the rate of change to smokeless methods in existing houses exceeds the rate at which smoke-producing grates are put into new houses. Up to the present it is impossible to secure (a) and while it is possible that (b) has already occured the position is complicated by the fact that the real criterion is the number of appliances multiplied by time in use. That is, for example, if four smokeless appliances replace coal grates in existing houses, but in rooms that are used only four hours a day, and at the same time a new house is erected with a coal fire in the living room, which is burning sixteen hours a day, the net amount of smoke emitted will be the same.

The efforts of the smoke abatement movement, or perhaps more correctly of the smokeless appliance makers, up to now have been, in effect, to prevent conditions becoming worse. This may appear to be a negative achievement, but it is easy to imagine the deplorable conditions that would now exist, as a result of the new houses, if coal had been used for every purpose.

TABLE I.

	No. of Stations Showing Reduction	No. of Stations Showing Increase	No. of Stations Showing No Difference
Insoluble Matter—			
Tar	26	16	14
Carbonaceous other than Tar	28	27	2
Ash	37	19	1
Soluble Matter—			
Loss on Ignition	40	17	0
Ash	44	13	0
Total Solids	41	17	1
Included in Soluble Matter—			
Sulphates	40	15	1
Chlorine	35	20	1
Ammonia	42	10	4

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Table I. (from page 8 of the report) shows that there have been reductions of deposit at more stations than there have been increases. The " total solids " figure more or less summarizes the position, and it will be seen that there is an improvement in 41 cases, a setback in 17, and no change in one. The conclusion that notwithstanding this, the position is worse is dervied from a further table in which the deposit for all stations grouped together is expressed as a percentage of the " general average " for the previous years. (Generally the five years ended March 31st, 1932). This shows that the percentage improvement for the year of the report is smaller than in the preceding years. The total solids figures are :

1931-32 86% of the general average.
1932-33 89% „ „ „
1933-34 87% „ „ „
1934-35 92% „ „ „

Since the majority of stations show an improvement over the previous year it would appear that this result which is for all stations grouped together, is due to the improvements, although greater in number, having a smaller aggregate reduction than the aggregate increase of deposit in the other stations. Examination of a further chart, which gives the current deposit for each station together with its general average (page 41 of the report) shows than such excessive increases have occured at several stations, notably the London stations of Finsbury Park, Archbishop's Park, and Golden Lane. The detailed figures for these stations show that their aggregate deposit of " total solids " has risen from 38,341 (5 year average) to 52,293 grams per square dekametre, for the year under review.

The following is the list of stations, with the deposit for the year expressed in English tons per square mile. The bold figure is the percentage of the deposit given compared with that station's " general average."

TABLE II.

Birmingham, Great Charles Street	241	—
West Heath	149	**112**
Bournville, Works	176	**127**
Bradford, Central	363	—
North	165	—
Burnley, Bank Hall Hospital	323	—
Parker Lane	457	—
Queen's Park	370	**115**
Cardiff	142	**79**
Castleford	323	**90**
Coventry	275	—
Dewsbury, Manorcroft	215	—
Ravensthorpe	256	—
Whitley	126	—
Edinburgh, Bruntsfield House	165	**99**
Leith Links	196	**109**
Garston	99	**66**
Glasgow, Alexandra Park	324	**114**
Bellahouston Park	213	**86**
Botanic Gardens	286	**93**
Glasgow Cross	344	—
Queens Park	190	**91**
Richmond Park	290	**96**
Ruchill Park	244	**99**
Tollcross Park	344	**114**
Victoria Park	223	**69**
Gloucester	119	**66**
Halifax, Akroyd Park	139	—
Belle Vue Park	147	—
Infirmary	135	—
Wade Street	274	—
West View Park	123	—
Huddersfield, Cooper Bridge	102	**29**
Deighton	222	**56**
Kingston-upon-Hull, Central	301	**85**
Suburban	159	**96**
Leeds, Headingley	125	**95**
Hunslet	307	**94**
Park Square	372	**105**
Temple Newsam	88	**89**
York Road	298	**94**
Leicester, Humberstone	144	—
Jarvis Street	279	—
Town Hall	264	**76**
Liverpool, Aigburth Vale	138	—
Cambridge Street	295	**94**
Netherfield Road	602	**105**
St. George's Hall	308	—
London, Archbishop's Park	407	**134**
Finsbury Park	390	**153**
Golden Lane	536	**128**
Horseferry Road	322	—
Kew Observatory, " N "	114	**92**
Kew Observatory, " S "	123	**91**
Mount Street	262	—
Ravenscourt Park	242	**72**
South Kensington (MO)	259	**104**
Southwark Park	217	**76**
Victoria Park	222	**105**
Wandsworth Common	155	**82**
Westminster (K. Charles Street)	226	**81**
Loughborough	200	**68**
Marple	107	**63**
Newcastle-upon-Tyne, Town Moor	241	**97**
Welbeck Reservoir	223	—
Westgate Road	298	**77**
Rochdale, Town Hall	241	**87**
Rothamsted	85	**73**
Rotherham, Oakwood Hall Sanatorium	183	**122**
Technical College	294	—
St. Helens	439	**96**
Salford, Drinkwater Park	181	—
Ladywell Sanatorium	266	**91**
Peel Park	313	**81**

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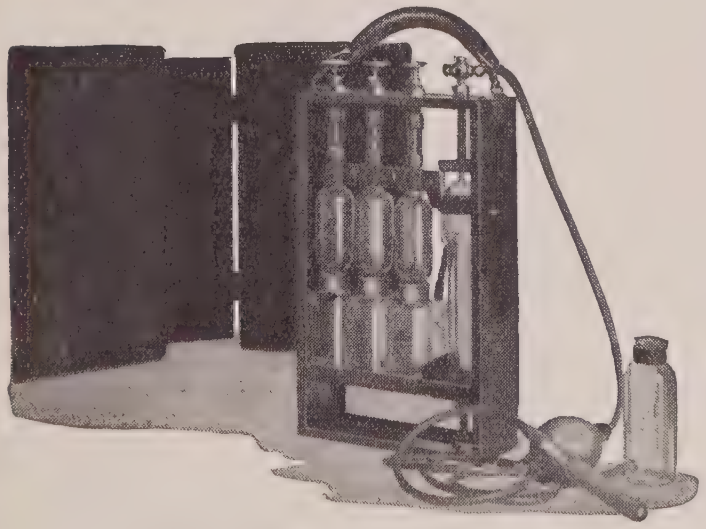

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Shipley	164	—
Southampton	150	—
Southport, Bedford Road Park	137	—
Hesketh Park	108	**83**
Marshside	174	**103**
Stoke-on-Trent, Leek Road	237	**108**
Longton	291	**100**
Wakefield, Clarence Park	94	**67**
W.R. Rivers Board	232	**82**
Wallsend, The Rectory	211	—
Walsall	123	—

The report of the Standing Conference of Co-operating Bodies (of which Bailie W. Brownhill Smith is now chairman, in succession to Dr. H. A. Des Voeux) states that to obtain a truer interpretation of the data further knowledge is required on certain points, which might best be obtained by an amplification of air pollution observations correlated with meteorological observations. In this connection observations in rural and country areas would be particularly welcomed, and in fact are almost essential if the utmost value from the records is to be secured.

The Conference welcomes the preparation by the Research Committee of a book dealing with the various aspects of atmospheric pollution as ordinarily understood. The aim is to produce what might be termed a standard text-book of a kind likely to be useful to local authorities concerned with atmospheric pollution. The Conference are indebted to the individual members of the Research Committee who are taking the responsibility of writing the various chapters of the monograph.

Erroneous Inferences.

The following paragraph from the Research Committee's Report is particularly valuable in that it may help to correct the comparisons which inevitably are made when the bare figures are perused :

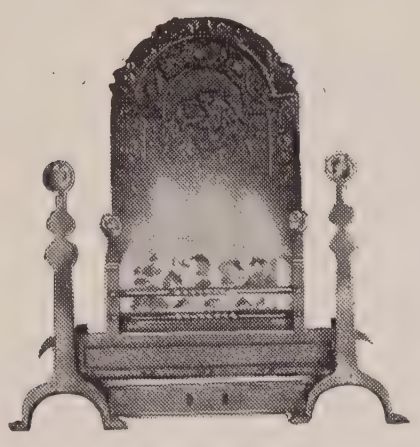
" Our attention has once again been called to inferences which have been drawn as the result of comparison of the records of deposited pollution for individual towns. The fact that the deposits for a particular town are higher than the average by no means necessarily implies that proper steps are not being taken to deal with the local problems of pollution, nor does the fact that the deposit gauge results in one town are higher than in another necessarily mean that the atmosphere of the first town is more heavily polluted, as indeed has already been pointed out in the Standing Conference Report for 1931-32. It is in fact quite as probable that the town in question is making a serious effort to arrive at the real measure of local pollution by placing its gauges in positions where the deposits recorded would be likely to be heaviest. In that case the very real assistance given to this co-operative investigation by the locality in question becomes a matter of appreciative comment. While criticism can more safely be made where the amount of the deposits recorded at the same station shows a consistent increase, it is clear that the only reasonable method of arriving at any comparitive criterion of pollution between various districts, or indeed, as stated above, of the degree of pollution in a particular area, is to make use of such a number of recording instruments as will enable the fullest possible account to be taken of the conditions obtaining in each locality."

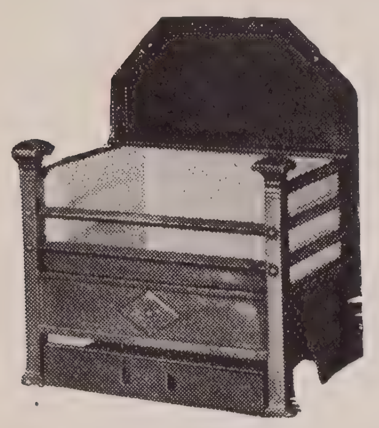
Statistical Survey of Twenty Years' Observations

The completion of twenty years' observations on atmospheric pollution has been made the occasion for a statistical examination of the records obtained from the deposit gauges. This examination, which deals particularly with the records of London and Glasgow was made by Mr. B. H. Wilsdon—until lately Superintendent of the Building Research Station—and has brought to light a number of interesting points. It has established, for example, a remarkable difference in the seasonal variations of the soluble and insoluble constituents of the deposits. Whereas the deposits of soluble matter fall to a minimum in the months of April, May, and June, insoluble matter is at a maximum during these months.

The general trend of the results confirms the conclusion that the level of deposited impurity is as great as ever. As regards the insoluble component there appears to be no foundation for the belief that there has been a progressive improvement during any part of the twenty years. In connection with soluble component the figures indicate an improvement during the first eight years of the period. This, it is suggested, may be due to the burning of a lower quality of domestic coal during the war years followed by a marked improvement during the post-war period. Other changes, such as a rapid spread of bituminous material on roads may also have taken place.

A point which the analysis brings out very clearly is that a considerable proportion of the soluble deposits are brought into the gauges only when it rains. This raises the question of whether matter soluble in rain is actually contained in the rain cloud, and perhaps transported considerable distances with it, or whether it is washed out of the atmosphere as the rain falls through it. Further investigations are necessary to settle this and other points raised by the survey and the Research Committee are putting these in hand. In particular experiments are being made to determine the change which may occur in the deposits brought down by rain, in different intervals of time, during a shower. Sheltered and unsheltered gauges are also being used to find out how far the deposits represent the actual pollution in the locality itself. It is also proposed to make a comparison of the insoluble deposits collected in towns on the one hand and in country districts on the other.





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Sulphur Pollution in the Atmosphere.

The Report includes the records of results with the two methods of measuring sulphur pollution in the atmosphere developed by the Research Committee. The first is the volumetric method which gives data regarding the concentration of sulphur dioxide in the atmosphere and is being employed at 12 stations. The other gives an estimate of active sulphur by measuring its effect on exposed candles of lead peroxide. This is being employed at 39 stations. As regards the results the Report states that Cardiff appears to be unusually free from sulphur pollution, as indicated by the figures for both methods. London County Hall, Westminster Bridge, on the other hand, shows some very high figures for active sulphur. In view of the high sulphur results in London, Mr. Coste, Chief Chemist of the London County Council and a member of the Research Committee, was asked to contribute a note to the Report dealing with this matter.

" The London results," he says, " although showing marked seasonal variations which may be attributed, in the main, to increased fuel consumption in winter, are evidently affected to a great extent by other than domestic sources.

" The southward movement of industrial undertakings and the large number of tall chimneys to be seen all over London may account for the general high sulphur content of London air."

Further Work Planned.

As a result of a further review of their programme of work and the need for more data in the interpretation of the measures of pollution, the Research Committee feel convinced that a special investigation on a larger scale than any which are at present being carried out will have to be attempted. One of the main requirements of the investigation is to obtain information about the nature and extent of pollution in large industrial areas, but the instruments actually in use are too few and too widely scattered to enable anything like complete information of the extent of distribution of the various types of pollution to be obtained for any one area. The most hopeful method of obtaining such information is to supplement existing effort by the initiation of a special survey with a large number of instruments covering a specially selected industrial centre, if possible at a distance from the main industrial areas.

Not only would such a survey provide the means for a better appreciation of the data which are already being obtained, but it should also throw light on a further problem which is naturally of great interest to local authorities, namely, the extent to which one area is affected by pollution coming from another area.

An investigation of this character, which is expected to take at least two years, is now being carefully planned and a special investigator has been appointed to take charge of it.

PRESS CUTTINGS

Miasma of Poison.

The constant propagands of the National Smoke Abatement Society has worked wonders in making factories consume their own noxious gases, but these efforts have only succeeded in preventing the atmosphere from becoming still more polluted. The practical disappearance of " London particulars," for example, has lulled us into a false sense of cleanliness. We still produce enough smoke to cause dense fog if unfavourable weather conditions persist for longer than three hours. The solution might be found in prevailing upon the chemist to provide a household fuel which gave us the old-fashioned glow and cheering flame without its resultant miasma of poison. Is that demanding the impossible ?—*The Morning Post.*

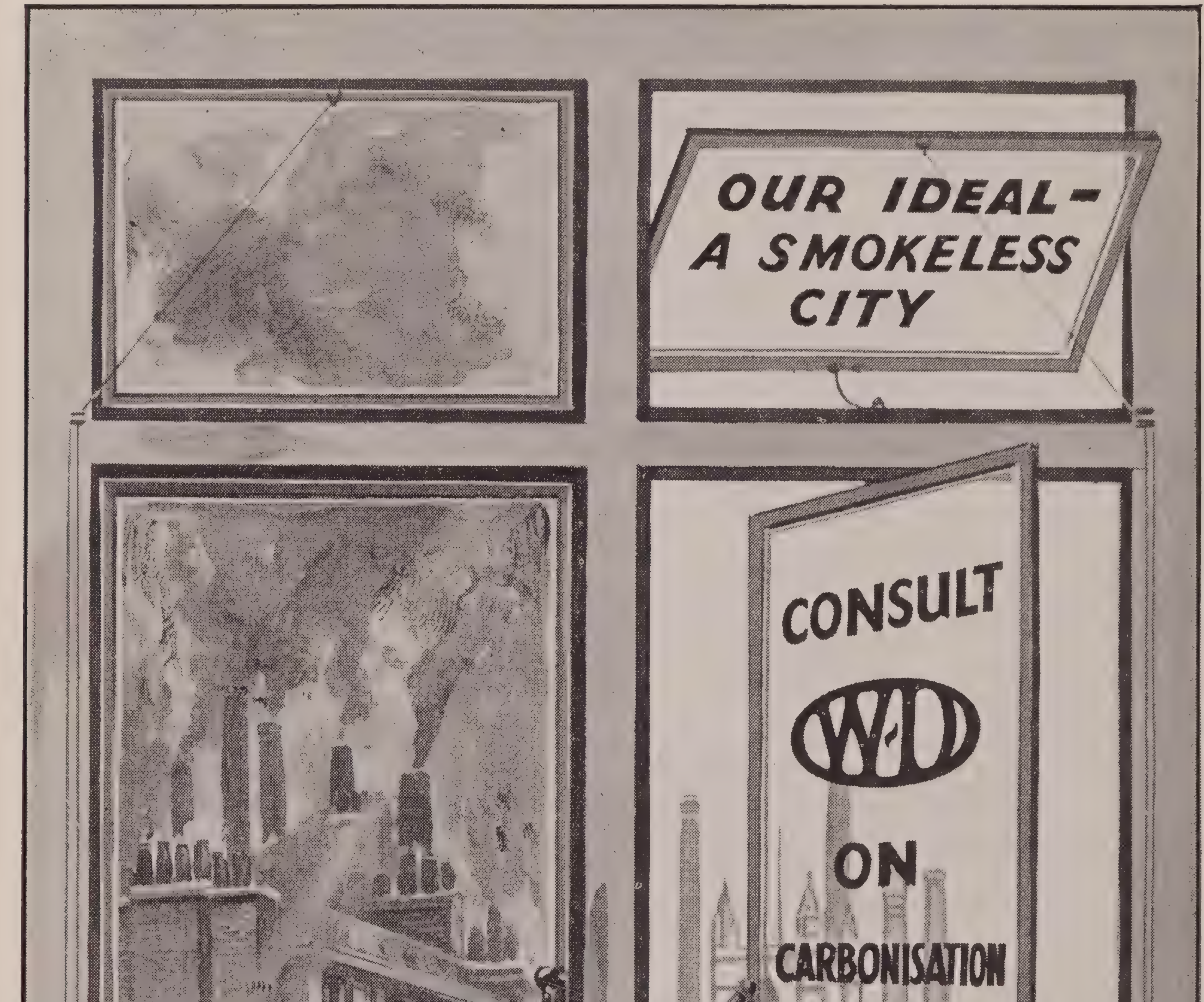
Health Before Comfort.

There is nothing more attractive and satisfying than an open coal fire, but the health of the people must be placed before comfort. Our smoke pall cuts out the health-giving ultra-violet rays of the sun and so makes city dwellers less resistant to disease. The smoke pall must go !—*Liverpool Evening Express.*

Campaign Should be Launched.

The main hope for bringing about a change lies in making the nation, as a whole, smoke-conscious, and a campaign with this end in view should be launched by the interests who stand to gain directly from a widespresd movement towards smoke abatement. What then are the manufacturers of smokeless fuels and the special grates which will burn these fuels, the gas companies, and the electric supply authorities doing in this way ? At the moment there does not appear to be mush constructive effort, nor is the general public receiving much encouragement to change over to some form of heating which will cut down to a minimum the amount of smoke allowed to pollute the air. An extensive advertising campaign, which emphasized the savings—in money—to the consumer as a result of reducing the nuisance of his chimney, would meet with wide success, particularly if the bodies sponsoring the propaganda would see that the change-over cost the consumer as little as possible.

—*Manchester Guardian Commercial.*



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"THE FACE OF BRITAIN"

A FILM TO SEE

One of the striking scenes from the film "The Face of Britain."

We have not before had the opportunity of recommending our readers to see a film, but in "The Face of Britain" there is a picture that will be appreciated by all who have realized the degradation of our country that smoke, with slums and other things, has brought, and which it is the job of the present age to get removed.

"The Face of Britain" is a documentary film, produced for G. B. Instructional Ltd. by Paul Rotha, whose name is familiar to all who are interested in the intelligent progress of the cinema. To the admirable direction and photography is added an equally admirable narration by A. J. Cummings, the well-known journalist.

The film, which takes about a quarter of an hour to show, takes us right into the heart of Britain: not the show places but the places in which we live and work—the fields, the country town, the hideously devastated areas of industrialism, and the better homes and cleaner towns that are coming. After showing, in a series of striking scenes, the real and lasting Britain of ploughed field and cottage and market place, we are introduced to the grim desolation of what the film rightly calls "The Smoke Age."

This section, coming as it does after the sunny serenity of the first part, is one of the best pieces of propaganda we can hope to see. The sense of ugliness and blight that is conveyed is powerful and significant. Drab towns and the diseased countryside that surrounds them, smoking chimneys, smouldering pit heaps, huddled, tawdry houses, are shown in quick succession, and especially telling are shots of the squalor that heedless industry has brought, taken across a graveyard as foreground. And the commentary of Mr. Cummings is apt and persuasive, adding materially to the force of the visual message.

From this the film passes on to the "New Age," and the growth of new methods of power production. It is highly effective and cleverly photographed, but, while no fault of commission can be found, there are from our particular point of view, perhaps some faults of omission. There are several ways of utilizing our coal resources to better advantage, and in such a film one feels that all should have been indicated. The film, however, was not taken from our particular point of view, and perhaps it is not valid criticism to point out what appears to us to be a limitation.

We hope that it is being widely exhibited, for it will bring home to many for the first time a real and vivid understanding of what the face of Britain was, what it has become, and how it may be transformed again into a thing of beauty.

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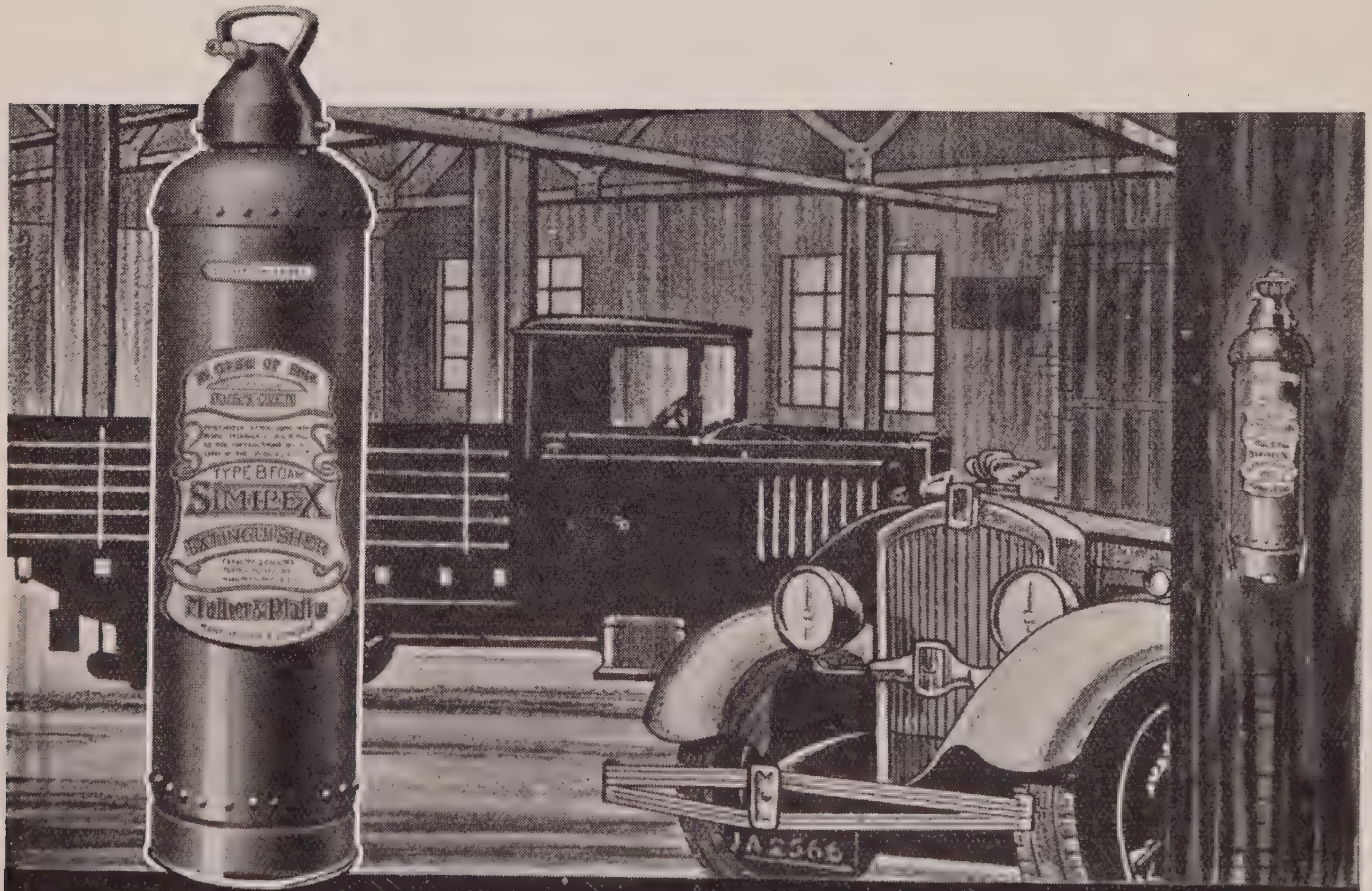

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NEWS AND VIEWS

The Regional Committees.

Beginning in the next issue we hope to publish regularly a page of news relating to the activities of the Regional Committees. This, apart from its general interest, will, it is hoped, be of especial value to the members of these Committees in enabling them to keep informed of the work that is being done by others.

A Conference at Bath.

At a sessional meeting of the Royal Sanitary Institute held at Bath recently a paper on smoke abatement was read by Mr. A. Tyler, M.S.I.A., Chief Sanitary Inspector of the City of Bath. Mr. Tyler suggested the formation of a Regional Smoke Abatement Committee for the West of England on the lines of similar committees in other areas.

The Coming of Coal to London.

Mr. A. W. R. Moller, in an article entitled " The Early Days of the London Coal Trade " in the March number of " Chamber's Journal," describes the change from wood to coal in London in the sixteenth century. " How did the inhabitants of London take this change of fuel," he asks, " this change which an apparently unkind Fate was forcing upon them ? "

" They took it badly. Frankly, they did not like coal. Their new fuel presented many disadvantages. It brought smoke and smell, it produced fumes and odours. Pure air was being polluted. The Londoner's hearth, whence formerly a wood fire had greeted him, sending to his nostrils the fragrant scent of smouldering and burning wood, now belched forth volumes of black smoke, an ominous welcome as he drew near. And if he sought escape outside his home, what then ? A cloud of dusty smoke, a veritable canopy of blackness, hung suspended in the air above his head, obscuring his view and darkening the sky. Coal, so it was reported, was bad for the health. Not only was it reported, to be so, but soon the would-be wise shook their heads and proved it to be so. Singular symptoms and queer illnesses, unknown in the good old days when wood was used, now appeared. Health and life itself were being strangely attacked by a sinister force. And thus rumours spread and imagination magnified, and coal, which had come to stay, was given but a poor welcome. The alternative, however, to using coal was to freeze by an empty grate, and so the Elizabethan chose the lesser of the two evils."

U.S.A. Convention.

The 30th Annual Convention of the Smoke Prevention Association of the United States is to be held in June in Atlanta, when there will also be smoke abatement and fuel burning exhibition. Among the speakers will be Dr. R. R. Sayers, of the Department of Industrial Hygiene and Sanitation, United States Public Heatlh Service.

A Question in the Commons.

Mr. David Adams asked the First Commissioner of Works whether he is aware that the Department of Industrial and Scientific Research and the leading municipalities of the United Kingdom agree that coal-burning fires are the prime cause of atmospheric pollution causing injury to the public health and public buildings, added risks to aviation and other difficulties ; why almost all the offices and departments under his control in London are heated with raw coal ; and whether he will introduce and gradually extend the use of smokeless fuel as in the Lobbies of this House ?

The First Commissioner of Works (Mr. Ormsby-Gore) : Yes, Sir. I am aware of the causes and effects of atmospheric pollution, but I understand that there is a ready market for all the present production of smokeless fuel suitable for open fireplaces ; the total sale would not be increased by any order I might give and the question of atmospheric pollution would not be affected. About two-thirds of the accommodation under my control in London is heated by plants consuming smokeless fuel of various kinds : for open fireplaces suitable smokeless fuel is used wherever local circumstances make it possible without unreasonable increase of cost. Apart from the fact that there was some dissatisfaction when smokeless fuel was used in the Lobby fires some time ago, I should not be justified at present prices in using smokeless fuel in the fireplaces of this House.

The Manchester and District Branch.

A meeting of the Branch was held in the Central Library on February 26th, and was presided over by Lord Stamford. Dr. John S. Taylor, assistant Medical Officer of Health for Manchester gave an address on " Smoke and Health," in which he said that between 1910 and 1927 Manchester was not greatly troubled by severe fogs, but since 1928 they had considerably increased. The increase was certainly not due to growing industrial activity, and he attributed the cause to the increase of domestic smoke emitted by the new housing estates all round the city.

To-day in Manchester 3,000,000 tons of coal were burned annually, of which 750,000 tons were used for domestic purposes. Eleven hundred factory chimneys and 150,000 house chimneys were continuously discharging the products of the incomplete combustion of these millions of tons of coal. As a result 20,000 tons of solid matter fell annually in the city area, and tar and acids to the amount of 75,000 and 200,000 gallons respectively. " And this in spite of the fact that during the last thirty years the industrial smoke of the city has been reduced by approximately 75%."

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(32)

SMOKE ABATEMENT IN SHEFFIELD, ROTHERHAM, AND DISTRICT

BY JAMES LAW (FIRST CLASS B.O.T. ENGINEER) M.S.I.A., CHIEF SMOKE INSPECTOR

Having read with considerable interest the first of a series of articles dealing with the abatement of smoke nuisance, it is now my turn to give, with some detail, an account of what is being done in Sheffield, Rotherham, and District.

There is little need to remark about smoke in this district, we are very conscious that we suffer from it, but unlike the population of London, we do not accuse our neighbours of causing it by burning refuse in their gardens, we try to find the causes and to put into operation the best practicable remedies for them.

There still remains a section of the population who are of the opinion that " Where there's muck there's money " and another section who think that " it has always been smoky and it's of no use trying to change the conditions."

Another section has arisen who are intolerant of smoke and are determined to leave no stone unturned to improve the existing state of the atmosphere. It has always been a matter of surprise to read and hear about the proportion of pollution attributed to domestic fireplaces, particularly in the industrial areas where it is obvious that the major proportion is due to industrial chimneys.

Types of Industry.

The principal industries of this area are the production of coal, coke, iron and steel, which being of a basic nature, are not so simple to carry out without causing nuisance as most people would imagine.

The Public Health Act, 1875 gives an indication of the difficulties met with in these industries, Section 334 stating that " Nothing in this Act shall be construed to extend to mines of different descriptions so as to interfere with, or to obstruct, the efficient working of the same ; nor to the smelting of ores and minerals, nor to the calcining, puddling and rolling of iron and other metals, nor to the conversion of pig iron into wrought iron, so as to obstruct or interfere with any of such processes respectively."

This is only a " qualified " exemption, but it is one that can be used as a strong defence against restrictions for these classes of industry, though it has not assisted the boiler chimneys at the collieries to any extent because it has been proved that they can be worked with a minimum of smoke, so that there is no interference with the efficient working.

Collieries.

At collieries the fuel is raised to the surface, cleaned and graded. If the cleaning is a " dry " process, there is the possibility of pollution at this source. Part of the residual material is sent away to the boiler house where it is used for steam raising, the remainder being deposited on the " spoil heap " A colliery boiler house is to all intents and purposes an " incinerator " where unmarketable fuel is disposed of. The fuel is perhaps of low calorific value and is heavy in ash. If there is a washery at the colliery certain washery settlings are sent to the boiler house to be used. The fuel receives many names and varies considerably in size and composition, known as " batts," " belt pickings," " dry fines," " slurry," and " washery settlings."

Most colliery boilers are of the hand-fired Lancashire types with varied methods of forced draught to increase evaporation and assist combustion. Steam demands are generally heavy and in many cases " forcing of fires " has to take place in order to maintain steam pressure, so that smoke nuisance is prevalent.

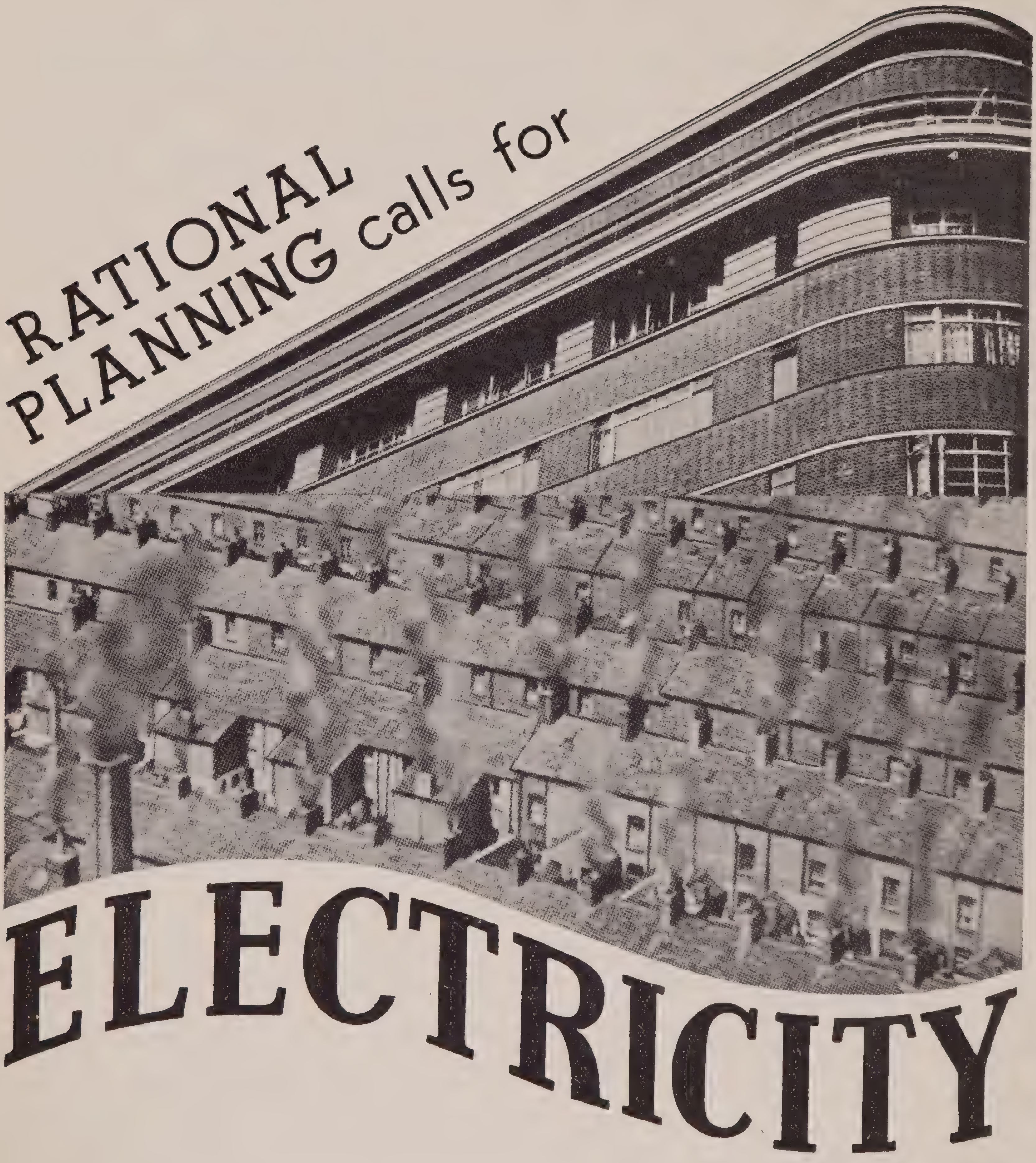
The Ministry of Health suggested as a general recommendation a " Time Standard " of two minutes smoke in thirty, but it is difficult to imagine batteries of 14 Lancashire boilers keeping to a standard of this kind.

" Spoil Heaps."

Material which cannot be utilized on the boilers is deposited on the " spoil heap " where the tendency to spontaneous combustion is prevalent and results in considerable discomfort and unpleasantness to the surrounding inhabitants. It is agreed that waste material must be disposed of, but greater care and more discrimination are necessary in order to control this waste material, a certain amount of which has a marketable value.

Coke-Oven Plants.

Most collieries to-day have installed coke-oven and by-product plants and this adds to the pollution difficulty. Unless coke-oven plants have been seen in operation it is not possible to appreciate the amount of nuisance that can be caused. The battery consists of about fifty or sixty ovens erected together to form a rectangular brickwork pile about 200 feet long and 20 feet high, with a charging machine which moves along the top. The fuel is dropped through apertures during the charging process, the oven being disconnected from the



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gas main, so that any gas which is generated passes into the atmosphere. When the material has been subjected to heat for the correct period the lower end doors of these ovens are removed and the incandescent coke is pushed on to a sloping platform and then quenched with water or placed in a steel coke car which is then taken into a quenching tower. During quenching large volumes of vapour are discharged into the atmosphere and in consequence the vicinity is enveloped in a white haze, particularly on days when the atmosphere is humid and heavy. Added to this there are many by-product plants which may cause pollution though considerable improvements have been effected.

The Chief Alkali Inspector, in his Annual Report for 1934 states: "Anyone who has witnessed the charging of ovens in different localities cannot fail to be struck by the variations in the volume of smoke emitted and often the worst cases are due to carelessness or indifference. In my opinion this matter is a reproach to an industry which prides itself on being progressive and efficient as indeed it is in other respects."

Metallurgical Process Work.

The greater proportion of the chimneys in the area and those which cause the most nuisance are the process chimneys of steelworks. The processes are many and varied and a list of the principal types with the various classes of fuel used is appended. It has been the contention of manufacturers that a "smoky" atmosphere was essential in the manufacture of steel if the quality was to remain unimpaired, the reason being that a smoky atmosphere was reducing, there being no free oxygen in the furnace to cause scaling and decarburizing of the material. Whilst agreeing that a "reducing" atmosphere is essential for certain conditions, there is a distinction to be made between a reducing atmosphere and a "smoke screen" that is allowed to pass into the atmosphere and pollute the neighbourhood. When the Public Health (Smoke Abatement) Act, 1926 was introduced, strong opposition was made to it and in Section 1 (i) (e), the following further provisional exemptions were granted: "the processes of re-heating, annealing, hardening, forging, converting and carburizing iron and other metals, and if the Minister of Health makes a Provisional Order to that effect, any other Industrial process specified in the order.

"Provided that the Minister may by Provisional Order at any time after the expiration of five years from the passing of this Act exclude from the application of that section any processes specified in that Section as amended by this paragraph so far as Smoke Nuisances are concerned. An Order made under this Sub-section for including any process amongst the processes specified in Section 334 of this Act or for excluding any process therefrom may contain conditions and limitations subject to which the inclusion or exclusion is to take effect."

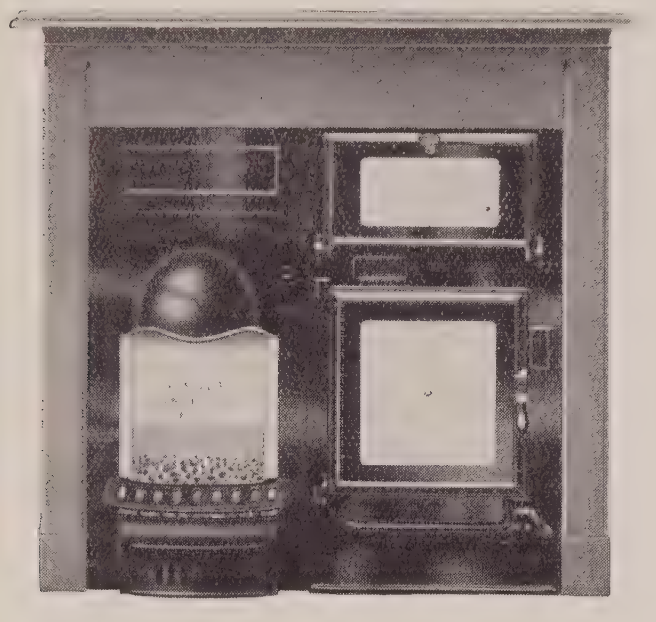
Regional Committee Work.

The passing of this Act gave an opportunity to the Sheffield and Rotherham Corporations to consider whether it was desirable they should combine to carry out their duties under Section 92 of the Public Health Act, 1875 in respect of smoke nuisances. Conferences were held between representatives of the two Corporations and after considering the question in all its aspects the representatives of each authority agreed to recommend their respective Councils to exercise the powers conferred upon them by Section 6 of the Act of 1926 and to combine to set up a Joint Committee to which the provisions of Section 57 of the Local Government Act, 1894 would apply. The recommendation was made in due course and approved and adopted by the Sheffield City Council and the Rotherham County Borough Council. An agreement was entered into and the Sheffield and Rotherham Joint Smoke Abatement Committee was appointed. It commenced to function in July, 1927. As a result, the question of Smoke Abatement entered upon a new phase. The conferences between the Health Committee of the Sheffield City Council and the Sheffield Manufacturers were transferred to and continued by the Sheffield and Rotherham Joint Smoke Abatement Committee and the representatives of the Manufacturers included Rotherham as well as Sheffield.

Arising out of these conferences, the Joint Advisory Committee of the Manufacturers and the Sheffield and Rotherham Joint Smoke Abatement Committee was formed in May, 1928. The work of this Joint Advisory Committee is referred to later. The staff of Smoke Inspectors was strengthened and regular observations were made of all factory chimneys in Sheffield and Rotherham as will more particularly appear hereafter.

The experience of the Sheffield and Rotherham Joint Smoke Abatement Committee satisfied them that the area covered by them should be extended and they decided to invite the Stocksbridge, Rawmarsh and Greasborough Urban District Councils and the Rotherham and Wortley Rural District Councils to combine with them. All these councils with the exception of the Wortley Rural District Council accepted the invitation, the Sheffield and Rotherham Joint Smoke Abatement Committee was abolished and the Sheffield, Rotherham, and District Smoke Abatement Committee constituted in its place.

The constituent authorities passed the necessary resolutions to combine to carry out their duties under Section 92 of the Public Health Act, 1875 in respect of smoke nuisances and to concur in appointing the Sheffield, Rotherham, and District Smoke Abatement Committee and also entered into an agreement embodying the terms of the resolution of combination, concurrence and appointment, and ancilliary provisions. This is the only Statutory Committee of its kind in the country, other Regional Committees formed on this subject acting only in an advisory capacity.



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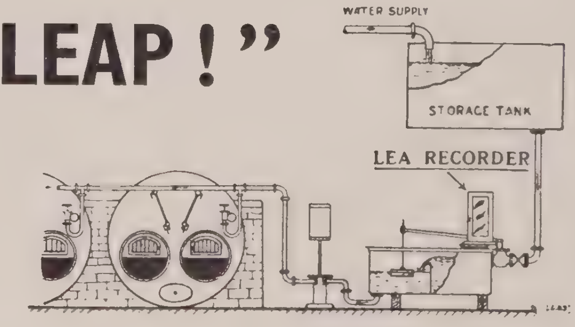

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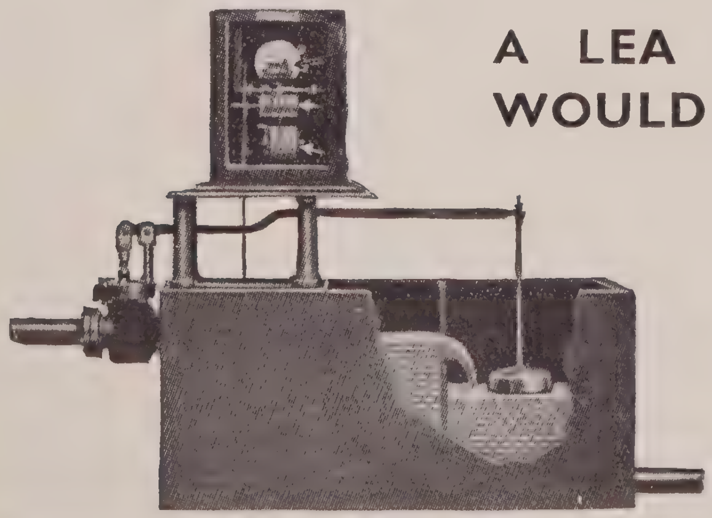

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The Sheffield, Rotherham, and District Smoke Abarement Committee still hope to induce the Wortley Rural District Council to combine with them for the reason that the area is incomplete whilst Ecclesfield and Chapeltown, both industrial districts, are outside their administrative area. The object of the Committee is to secure the exercise of the powers of the local authorities in respect of smoke nuisances over the whole of the industrial area in and around Sheffield in a uniform way and at the lowest possible administrative cost.

Research Work.

Reference has already been made to the conferences between the Smoke Abatement Committee and the Manufacturers Committee and the formation of the Joint Advisory Committee. This consisted of five members of each party with Professor C. H. Desch, Dean of the Faculty of Metallurgy of the Sheffield University, as Chairman.

Advantage was taken of Section No. 10 of the Public Health (Smoke Abatement) Act, 1926, research work was undertaken to investigate the difficulties of the industries and to assist in finding methods of steel production with a minimum of smoke. An agreement was made that for the time being no prosecutions should take place with regard to excessive smoke emission from Combination Chimneys or Metallurgical Process Chimneys—a Combination Chimney is one that takes away the products of combustion from boiler and process furnaces. This still operates and observations and inspection work have continued, each month a list of excessive smoke emissions being submitted to the Manufacturers' Committee for their consideration. In addition to this a number of the large works carried out their own research work and tried various methods in order to give greater efficiency and a minimum of smoke. A number of methods have been tried on the various types of furnaces certain of which were not successful, but others are now recognised as successful in their working.

In June, 1934, during a discussion on a Progress Report it was stated by Professor R. V. Wheeler, who had succeeded Professor C. H. Desch as Chairman of the Joint Advisory Committee, that " provided proper plant was used all steel processes could be carried out with a minimum of smoke, it could not be expected, however, that manufacturers would scrap their plant which had cost thousands of pounds to instal."

The Research Department considered that they had carried out research work on Metallurgical furnaces as far as they were able and proceed to investigate various classes of coke oven fuel for domestic range burning. The blending of coals for coke making, the grading of coke sizes and the suitability of various firegrates have been taken into consideration. This work is proceeding. The analysis and classification of various types of boiler fuels and slacks in use in the district is also being investigated.

Reconstruction Work.

With the revival of trade in 1935, reconstruction work was greatly increased and at the end of the year it was thought desirable that the Ministry of Health should be requested to investigate the whole of the situation with the object of repealing Section 1 (i) (e) of the Public Health (Smoke Abatement) Act, 1926.

There is yet a vast amount of reconstruction work to be carried out, but the pioneer stages are now passed and the work should go forward more quickly. The unique part of the practical results appear in the fact that a certain amount of success has been obtained with furnaces using every type of fuels. Coal, pulverized coal, producer gas, crude coke oven gas, town's gas, oil fuel, and coke. With low temperature furnaces, however, it is thought that gaseous fuel or electricity are the only successful methods of smokelessness.

Inspection Work.

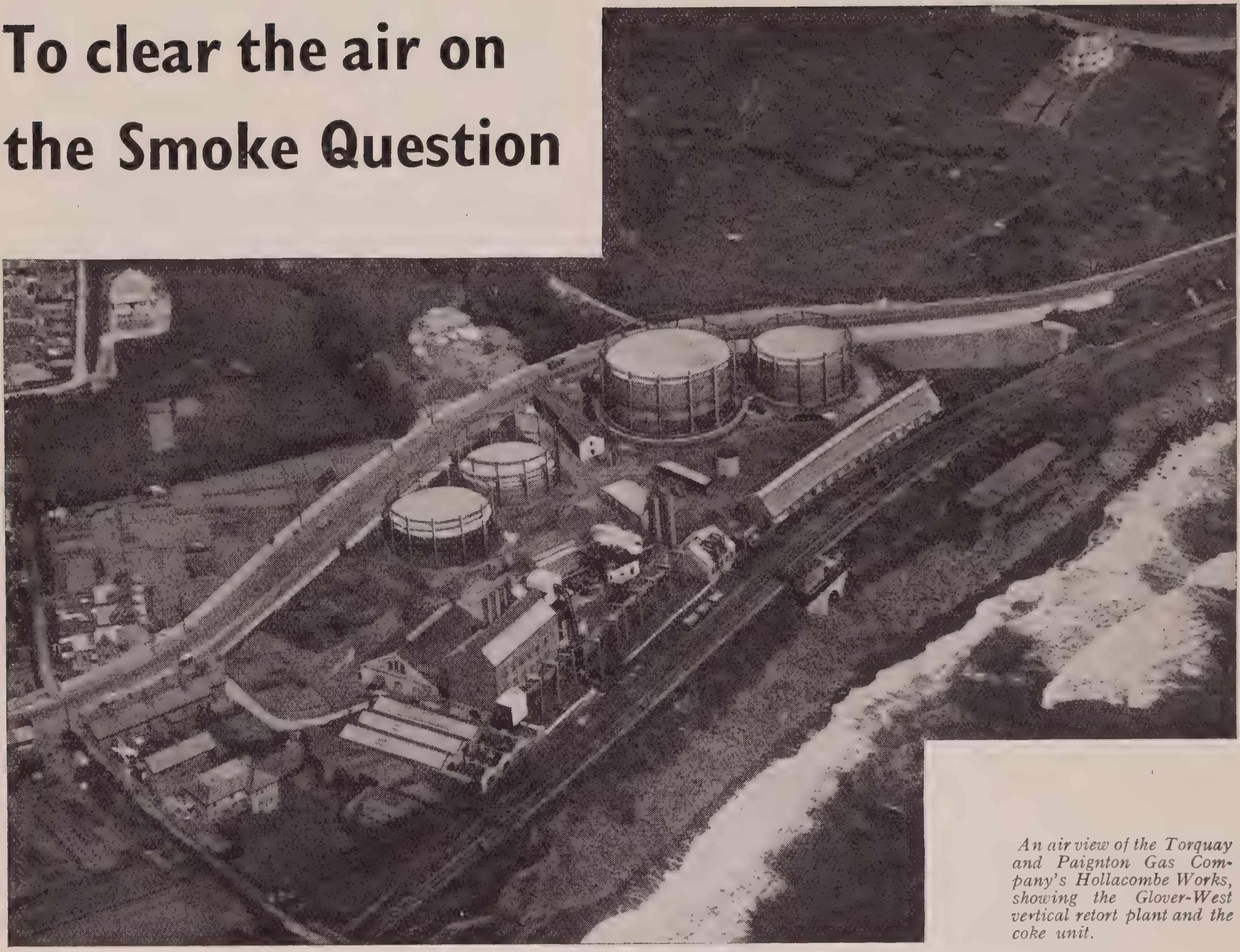
There are about 3,890 working chimneys in the area, which is about 123 square miles in extent and which can possibly be classed as one of the heaviest industrial areas in England. The area is divided into four districts and though it has not been found practicable to number every chimney, each works has been given a number and every chimney a designation.

The staff consists of five inspectors who are all qualified Inspectors with considerable practical experience, capable of advising manufacturers with regard to the efficient working of their plants, also of instructing firemen with respect to the best methods of charging and controlling their furnaces. Systematic observations are taken of all chimneys and records of the same are kept. When reported to the Committee for consideration, the number, designation and particulars of what the chimney serves only are given, so that the " vested interest " difficulty is to some extent ruled out. The policy of the Committee has been and continues to be " advisory " and though full statutory powers are given, coercion is not put into effect except in aggravated cases.

The number of boiler chimneys in operation in the area is about 960, the unusual part of the boiler house problem being the number of hand-fired Lancashire boilers in use. It is only recently that mechanically stokers have made any degree of progress, and water tube boilers are very much in the minority. A considerable proportion of the steam demand in steelworks is due to steam hammers for forge work. This is a difficult load to control on account of intermittent working, and the same applies in a lesser degree to the steam demand at rolling mills where stoppages are frequent for roller changing and gauging.

Vertical type boilers are difficult to control in many cases, because the draught is insufficient to burn the local types of coke. Boiler slacks can be purchased at much lower prices than coke which also adds to the difficulty.

To clear the air on the Smoke Question



An air view of the Torquay and Paignton Gas Company's Hollacombe Works, showing the Glover-West vertical retort plant and the coke unit.

Prior to the formal opening of magnificent modern gas showrooms at Torquay, Major R. P. Kitson, J.P., C.A., Chairman of of Directors of the Torquay and Paignton Gas Company said :—

> **" I think we are all agreed that the total abolition of smoke is a consummation devoutly to be wished. In all parts of the country atmospheric pollution is serious, but in a district like this, where we claim the manufacture of health as our industry, the importance of a clean atmosphere cannot be overstated. The gas industry to-day offers a service whose universal adoption would provide the solution to this grave problem, and, at the same time, utilize the natural wealth of the country to the fullest advantage."**

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Gas in Industry.

The use of gas for metallurgical process work is helping very considerably to minimize nuisance. Practically the whole of the gas distributed in the area is produced at the colliery coke ovens, taken to the gas undertakings' premises, purified and distributed.

In Sheffield this commodity is sold at a scale rate according to the quantity comsuned and can be purchased at 1/- per thousand cubic feet or 2.4 pence per therm for large quantities. In Rotherham the gas supplies are controlled by the Corporation who distribute crude coke oven gas for industrial purposes at 7½d. per thousand, and purified gas at 10d. per thousand cubic feet.

These prices enable manufacturers to instal specially designed gas-fired furnaces which can compete with the old coal fired furnaces and where accuracy of working is demanded they are definitely superior. One large steelworks has taken its own gas main from the adjacent coke-oven works and is using about a quarter of a million cubic feet of gas per hour. It is proposed to increase this amount considerably when a new battery of coke ovens which are being constructed are put into operation.

For high temperature work almost all types of fuel can be used with fair success, but where low temperatures are essential difficulty is apparent with solid fuel. Heat treatment and annealing processes cause the most nuisance and it would appear that these processes will convert to gas firing if nuisance is to be kept within reasonable standards.

Electricity in Industry.

Electricity is also helping in a substantial way in these industries. For power work, it has always been used extensively but it is also finding a place in steelmaking. For some years a proportion of melting has been done by electricity, and this is rapidly extending. One large steelworks has installed a plant for special work where hardening and tempering are done by this means. Comparative costs are 5¼ to one when compared against the price of coal, but accuracy of work, throughout and saving in labour, will, it is estimated, counterbalance the costs.

The use of pulverized fuel for certain work should be the ideal method, but so far only one or two companies have reported with favour on its use.

Domestic Smoke.

Gas and electricity prices compare favourably with those ruling in other localities and though the use of these commodities is extending daily for domestic purposes, the prices are not competitive with coal. Another difficulty is that a proportion of the population who are employed in collieries receive in addition to their wages an allowance of coal per month with only the cost of delivery as expenditure. How can this class be expected to use gas or electricity as a fuel for cooking and heating? Different arrangements will be necessary with the Colliery Companies to change these conditions.

Low Temperature Carbonized Fuel.

The winter consumption of fuel for domestic purposes is estimated at 12,000 tons and the available quantity of low temperature carbonized fuel at 600 tons per week. The comparative price is 50% higher, deliveries are somewhat irregular, so that there does not appear to be any immediate solution to the pollution difficulty in this manner. If this commodity could be produced on a large scale with more competitive prices than at present, greater progress could be made.

There is very little retort oven coke produced in the area and though a certain amount of success has been achieved with the use of graded coke-oven fuel, it is not suitable for all types of ranges, because it does not burn as easily as the retort oven coke produced at gasworks. At present, the demand for industrial purposes is such that coke-oven manufacturers are finding difficulty in dealing with the situation.

Comparative Prices.

In Sheffield, plus a rateable value charge, electricity is distributed at ⅜d. per unit, which is as low priced as most places in England. Special facilities are also given in Rotherham for domestic gas supplies by means of a " two-part tariff system " and subject to a " special charge " for supply—it is distributed at 10d. per thousand cubic feet.

It will be noted, therefore, that facilities are being given to every householder to use these commodities and a considerable number are making good use of these facilities.

Pollution Records.

These are being taken throughout the area in order that comparative results can be shown. Eight deposit pollution gauges have been installed, six of which are considered as " fixed " gauges and two as " mobile " gauges which are periodically moved to selected sites in order that comparative figures may be obtained. At three of these stations ultra-violet ray recording is carried out and sulphur determination by the lead peroxide method. There are also two volumetric method sulphur determination machines being used. It has been contended that considerable time is taken up in carrying out this work but working in conjunction with the City Analyst, the time taken does not amount to more than two hours per week. With all the vaunted cleanliness of Greater London and the Southern Counties the remarkable fact is shown in the Annual Report of Co-operating Bodies issued by the Department of Scientific and Industrial Research that with regard to solid matter and sulphur determination, South Yorkshire compares favourably with many other areas, the residential part of this area showing a consistent return as clean as most places in Rural England.

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Cost and Economic Factors.

Financially the cost of this Regional Smoke Abatement Scheme has surprised even the most optimistic of the Constituent Members of the Committee. The first years expenditure was estimated at £2,600 but was found to be only £1607. This has increased slightly each year the present year's expenditure being £1970. The smaller authorities receive their quota of inspection at a very low cost, Stocksbridge averaging £18 - 3 - 0 per annum—7/2 per week or about 15/1 per observation. Out of this expenditure has been borne the cost of research work and analysis fees, so that from an economic point of view, Statutory Regional control can stress this point as a distinct advantage.

Instructional Work.

With regard to instructional work, at first some difficulty was found in persuading the men to attend organized classes. At the College of Technology, Rotherham, these classes have just completed their second years work. In Sheffield under the direction of the Trades Technical Society of the Department of Applied Science at the University, classes have been successfully conducted and a Firemen's and Furnacemen's Technical Society has been established. Meetings and lectures have been in operation throughout the winter and works visits will be made during the summer. In this manner, interchange of methods between the workers can be made and discussions of difficulties can take place. A library with suitable books is also available to members. These lecturer will enable the workmen to qualify for the Certificates which are being issued by the City and Guilds of London Institute.

This part of the work is being carried out in order to keep in uniformity with other industrial centres, Manchester, Liverpool and Leeds having been in operation for several years. It is hoped that when the Certificates of the Guild are in general use that the boiler fireman will at last find a " status " which will give him definite recognition both financially and otherwise.

In concluding, I should like to remark that the six years of control which are now almost completed have been years of effort during a particularly depressing trade period and a certain amount of success has been attained. The Committee and the Staff remain conscious of the fact that there is yet an amount of work to be done, of difficulties to be overcome and of new types of nuisance which at present appear likely to become a menace. With the good will and co-operation of the Manufacturers these nuisances can be reduced to a minimum and it is realized that progress can only be made in this manner. We are satisfied that the efforts already made have been well worth while.

APPENDIX

MELTING FURNACES

	TYPE	FUEL USED	REMARKS
1.	Air Furnaces	Coal fired and producer gas fired	With coal fired furnaces and no secondary air—heavy smoke nuisance with " Flaming " at chimney top where re-ignition takes place. Where secondary air is used smoke is reduced and with producer gas smoke is at a minimum, except for a few minutes when starting.
2.	Blast Furnaces	Coke fired	The products of combustion are collected, cleansed and utilized for reheating furnaces and generation of steam in boilers.
3.	Cupolas (foundry)	Coke fired	No nuisance after starting except from grit deposit which can be easily arrested.
4.	Crucible melting	Coke, producer gas and Towns gas fired	Little nuisance except from " lighting off " furnaces when starting coke fired furnaces.
5.	Puddling and Ball furnaces	Coal, producer gas and Towns gas fired	Coal fired emit heavy smoke. Producer gas fired can be controlled and emit spasmodic smoke bursts. Towns gas—regenerative type—short bursts during reversal periods. Only two works of this kind in the area—working intermittently.
6.	Siemen's Martin Open Hearth Melting	Producer gas and coke oven gas fired	Short bursts of 20 to 30 seconds duration during reversal periods. Nuisance with older type caused at week-ends when the " burning off " of residue tar from gas mains and valves is carried out. With modern types and unit producers making ' brown ' gas and not carrying the same for any distance, there is little nuisance caused by " burning off."
7.	Electric H.F. and L.F. Melting	..	Light yellow haze emitted into shop—due to foreign matter in scrap being melted.

CONVERTER FURNACES

TYPE	FUEL USED	REMARKS
Tropenas Converters ..	Producer gas fired ..	No smoke from melting but heavy yellow and orange emissions during purifying process. There are three works carrying out this process and no efforts are made to " scrub " gases.
Cementation Converter .. or Blister Steel Maker	Coal fired	Heavy emissions of black smoke when raising temperature from cold material. This process takes from 9 to 15 days. There are only two plants of this kind in the Area and the work done is irregular. The probability is that these processes will be discontinued.

PROCESS FURNACES

TYPE	FUEL USED	REMARKS
Soaking Pit Furnaces ..	Coal producer gas, coke, .. oven gas and Town gas fired	Coal fired emit heavy smoke especially during replenishing periods when cold charges are put into the furnace. Producer gas fired furnaces give much better control, but crude coke oven gas and town gas fired furnaces are practically smokeless. Mechanical Stoking is being tried experimentally on old types.
Preheating Furnaces ..	Do.	Do. Not many of this type used.
Heavy forge Furnaces .. Drop forge Furnaces	Coal, producer gas, coke .. oven gas, Town's gas, blast furnace gas, coke and gas, pulverized fuel, crude oil and mechanically stoked coal fired.	Older types of furnaces cause bad smoke nuisance but modern types of coal fired with secondary and tertiary air can be better controlled. Certain mechanically stoked furnaces are smokeless. Certain producer gas fired furnaces cause nuisance due to lack of control. Other types are particularly good especially regenerative towns' gas fired furnaces, though as yet these are in the minority.
Bar Mill, Rod Mill, Wire.. Mill and continuous reheating furnaces for rolling purposes.	Do.	Do. except continuous reheating furnaces where throughput is often forced and causes smoke. No proper primary or secondary air on a considerable number of these furnaces.
Sheet Mill Furnaces ..	Coal, Producer gas, coke .. oven gas, Town's gas and crude oil fired	Older types considered worst smoke makers in Area, these are the furnaces which have received the greatest amount of research. Coal fired with controlled air can be made almost smokeless. Gas fired regenerative are perfect in their action and a fair number of this type has been installed.
Tempering and Hardening .. Furnaces	Coal, Producer gas and .. Town's gas fired	Older types cause bad smoke nuisance owing to low temperature and the necessity for controlling the atmosphere. This is essentially a gas fired process. Machine-knife manufacturers state that they must have a coal fired smoky atmosphere for successful finish but equal results can be obtained with gas fired furnaces at slightly greater cost.

HEAT TREATMENT FURNACES

TYPE	FUEL USED	REMARKS
Annealing Furnaces .. Pre-heating Furnaces Normalizing Furnaces	Coal, producer gas, coke .. oven gas, Town's gas, coke, Electric power	These are essentially low temperature furnaces and start up in most cases with a cold charge of material. With coal as fuel it is almost impossible to carry out the operations without causing nuisance, particularly when starting from cold. With producer gas except at the beginning of the process much better results are obtained. With crude coke oven gas and town's gas the process is almost smokeless. Some of the processes are exposed to the flame and a controlled atmosphere is essential, other processes are strip wire and bars in troughs and pots sealed and swarfed down. Little research has been carried out on these processes and it would appear that owing to low temperature workings that gas firing is the only successful method. A number of regenerative gas fired furnaces have been installed with thermostatic control. These are perfect heat treatment furnaces. Recent developments have been carried out with electric power and considerable success achieved.

THE SMOKE MERCHANTS AGAIN

AN ELABORATE DEFENCE OF THE COAL FIRE

The abolition of the coal smoke evil is only one of many changes that are gradually coming about in this present stage of transition between two eras of civilization. It is part of a vast movement that has for its end a higher form of society, and a fuller and richer individual life. The new era will be based upon adequate and controlled technics, in contrast with the fumbling technics of the primitive order from which we are slowly emerging.

The distinguished scientific journal "Nature," reviewing the first number of this *Journal*, stated how, with particular reference to smoke, the future would regard our present struggles: "In the next century commentators will scarcely fail to remark on the fact that in the nineteenth and twentieth centuries cultivated and intelligent people remained apathetic towards the pollution of the atmosphere by smoke. They will note the resistance, active and passive, towards this hygienic reform, characteristic of slum-dwellers, yet exhibited by even the most refined who would never tolerate the least defect in sanitation, public and domestic."

The passive resistance is too common for note, and the active resistance that is occasionally met with, has been noted in these columns from time to time. It will be of interest to the social historian to observe that in 1935-36 it became necessary to advertise extensively the traditional coal fire. That such advertisements would in due course be found necessary was, of course, inevitable, and their underlying significance has been noted by many.

A further indication of the active resistance noted by "Nature" is to be found in a series of articles on the domestic coal fire recently published in "The Coal Merchant and Shipper." Two out of five lengthy articles were devoted to an examination of the smoke abatement case and, as might be expected, demolished it to the complete satisfaction of the author, and it appears, of the retail coal trade generally.

To be fair it must be said that the articles are temperate in style and reasonable in spirit if not in logic; and the author, Mr. P. O. Roberts, a member of a London firm of coal merchants, generously acknowledges the sincerity of the smoke abatement movement and of the Society in particular, even though he doubts our wisdom.

It will be of interest, and of value in revealing the nature and validity of opposition to smoke abatement (of which more may be expected as the reform progresses), to review at some length the arguments used by Mr. Roberts.

The major weakness of his case, in considering both the health and economic aspects, is that he has no evidence of any kind with which to refute the vast amount of authoritative material that goes towards making the case for smoke abatement. He is content to criticize either isolated statistics or generalizations, and to allow his points to develop into surprisingly comprehensive conclusions.

An "Unbiased Summary."

It is stated "that evidence for and against every aspect of the matter has never been collected and analysed," that "a detailed, compact, and unbiased summary of these findings has never been presented," and that the articles are intended to be such a summary. The author presumably had not heard of the Report of the Minister of Health's Departmental Committee on Smoke and Noxious Vapours Abatement, which is surely the "detailed, compact, and unbiased summary demanded, the conclusions of which are, it is almost needless to say, diametrically opposed to those set forth so confidently in "The Coal Merchant and Shipper."

Mr. Roberts dismisses the effects of a polluted atmosphere upon health by examining a handful of mortality statistics. Where these support the view that smoke does affect health it is stated that other factors are the cause, and where they do not support the smoke abatement case it is considered clear proof that smoke does not affect health. That sulphur and tar cannot injure our health is, for instance, demonstrated by showing that the respiratory deaths in various towns are not proportional to the measured local deposits of these constituents of smoke! Nothing but deaths is considered, no evidence of a pathological nature is offered, no knowledge of physiological processes is even hinted at—and yet it is concluded, in summing up, "that certain ill-effects upon the public health, alleged to be due to coal smoke, are not due to smoke but to other causes."

The effects of smoke-fog upon the respiratory system, which constitute one of the most deplorable and best-known of the many manifestations of the injurious nature of smoke, are dealt with by the visual examination of a single graph. The evidence of countless medical men and Public Health officials, the findings of the Minister of Health's Departmental Committee, and scores of actual cases, are counted as nothing against the fact that, even though in this one case there was a rise in respiratory deaths during a period of smoke-fog, there was another rise at a time when there was no fog. From this it is concluded that "no causative relationship is noted between fog and deaths from respiratory disease."

In this matter Mr. Roberts does go so far as to admit that death is not the inevitable consequence of smoke-fog for, it is said, " fog in urban districts probably does cause a certain amount of discomfort to those suffering from respiratory diseases, but it is probably nothing worse than a temporary discomfort."

Ultra-Violet Light.

The effects due to the obstruction of light by smoke are dismissed with equal facility. Ultra-violet light only is considered, and while it is apparently admitted that it is absorbed by the smoke pall it is argued that this does not matter because (a) there is not much of it in any case, (b) one must be naked to obtain its full benefits, and (c) its function of producing vitamin D in the body can be neglected, for this vitamin can more reliably be obtained from certain foods. The speciousness of such arguments will be clear to anyone who has given any thought at all to the question, or who will consult a text-book dealing with it. Except for a reference to chlorosis, a form of anaemia, in which the importance of the light factor is minimized, none of the other consequences of the deprivation of light due to smoke are mentioned.

The action of smoke upon vegetation is said to be of little real consequence, while as regards buildings " coal smoke is a small, probably a very small factor among many others which are collectively responsible for damage to buildings." The evidence of Sir Frank Baines and many others, as well as the report on the subject by the Building Research Station, is overlooked. The blackening of buildings is too obvious to be put down to anything else but smoke, but Mr. Roberts easily overcomes that difficulty.

" It is agreed," he says, " that buildings are blackened by soot falling upon them, but are they any worse for that from the aesthetic point of view ? It is rather a matter for the taste of the individual, but it seems likely that the opinion of the majority would be that the weathered appearance is more pleasing to the eye than the new."

And then, it is argued, the " probably very small " corrosion of stone is not due to smoke but to sulphur acids, the quantity of which would tend to be increased by the use of carbonized coal in place of raw coal. The action of soot and tar, present only in smoke, in bringing the sulphur acids into intimate contact with the stone, is not mentioned.

" Clean Dirt."

Perhaps the choicest of the arguments used in these articles are those in which the author explains away the dirt to which most people have strong objections, even though they may never have heard of smoke abatement. Their foolishness in so objecting is made clear by quoting the passages in full—they are passages that are well worth recording. They are :

" The primary reason for washing the person is to remove exudations from the pores and abraded epithelium (outer skin). The removal of externally-deposited material, be it soot or anything else, is of far less consequence — it is, not inaptly, called ' clean dirt ' If that most important organ, the skin, is to do its work, one must wash just as much whether there are or are not coal fires. And this also applies to personal and bed linen. If those who live in the country neglect these hygienic considerations because they do not ' look dirty,' they will deserve all the skin and other troubles that they will surely get. If the effect of soot in towns is to make people wash themselves and those things with which they come into intimate contact sufficiently often to ensure cleanliness, it is, indirectly, an extremely beneficient thing, not only for the individual, but also from the point of view of the spread of infection.

" There are several factors which have their part in the soiling of table linen, and soot is one of the least, and there does not appear to be any reason why it should not be washed as frequently in the country as in towns. It is very probable that curtains and other hangings have to be washed more often in urban areas if appearance is the only consideration. But is it ? Occupied rooms, wherever they may be, provide conditions which are favourable to bacterial increase, and it is essential that hangings and upholstery should be washed or otherwise cleaned reasonably often for the sake of good health, even though they may not appear to require it.

" Many people, either from ignorance or because they will not go to the trouble and expense of such washing as is necessary for cleanliness are content to live in conditions which are certainly unhygienic. Such indifference is definitely against their own interests as well as against the interests of the community. It is rather surprising that anyone should encourage it, for that seems to be the only interpretation of the suggestion that laundry bills and washing expenses are considerably higher than they would be were there no coal smoke."

So the more dirt there is the cleaner shall we be, and smoke, after having been shown to be harmless to health, is apparently the promoter of good health among a people otherwise shockingly unhygienic.

On the whole we are indebted to Mr. Roberts for having, in all sincerity, produced what is probably the most elaborate defence of smoke yet attempted. It is useful to us because it shows us the grounds uopn which criticism can be expected, and reveals the degree of plausibility of such criticism. It is further, most satisfactory to see how superficial and of what small account are the arguments that can be used—it is hard to imagine them being given publicity outside the pages of a coal trade organ.

From their nature, and from the significant fact that they are not supported by a single item of independent, disinterested evidence, it is not likely that these articles will be used further as pro-smoke propaganda. We should however, be glad to be informed if any reader comes across any further reference to them.

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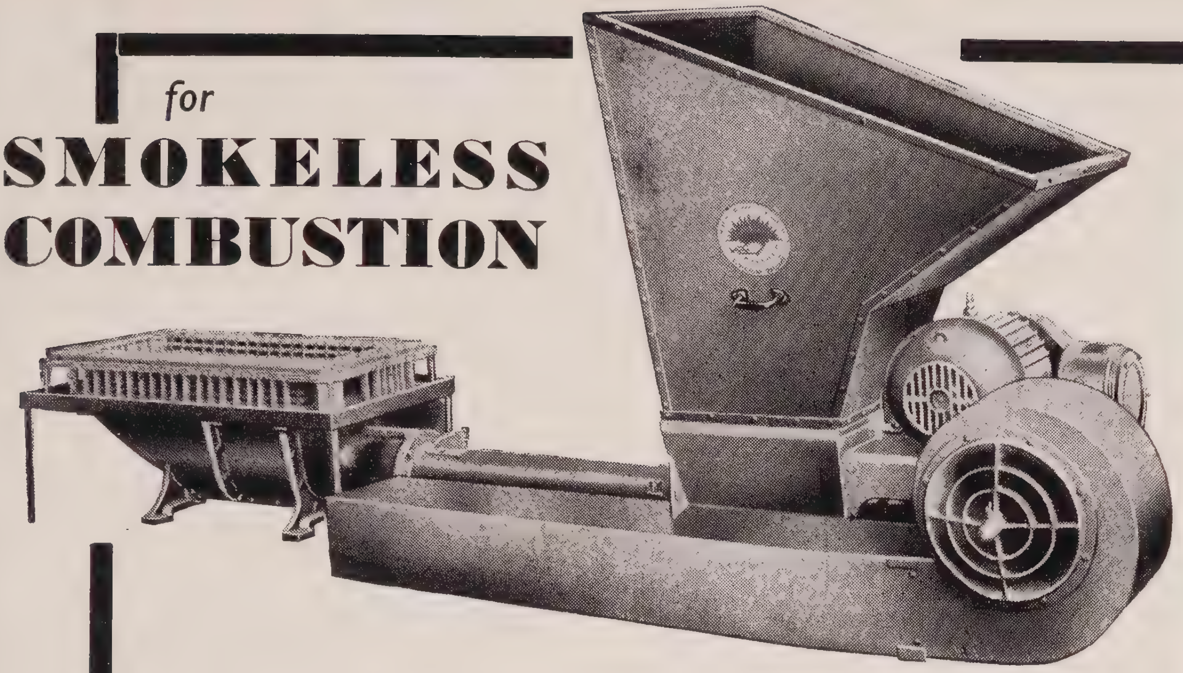

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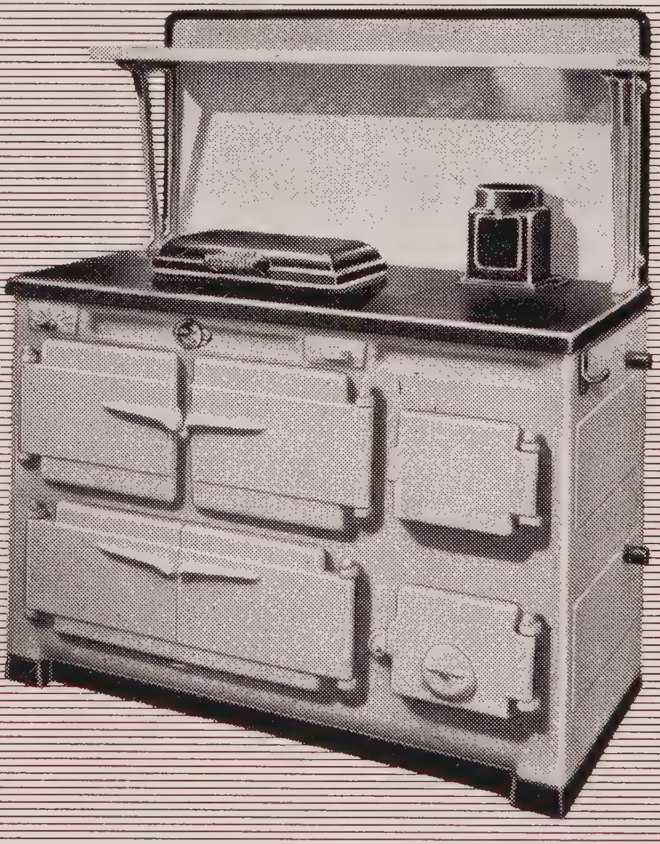

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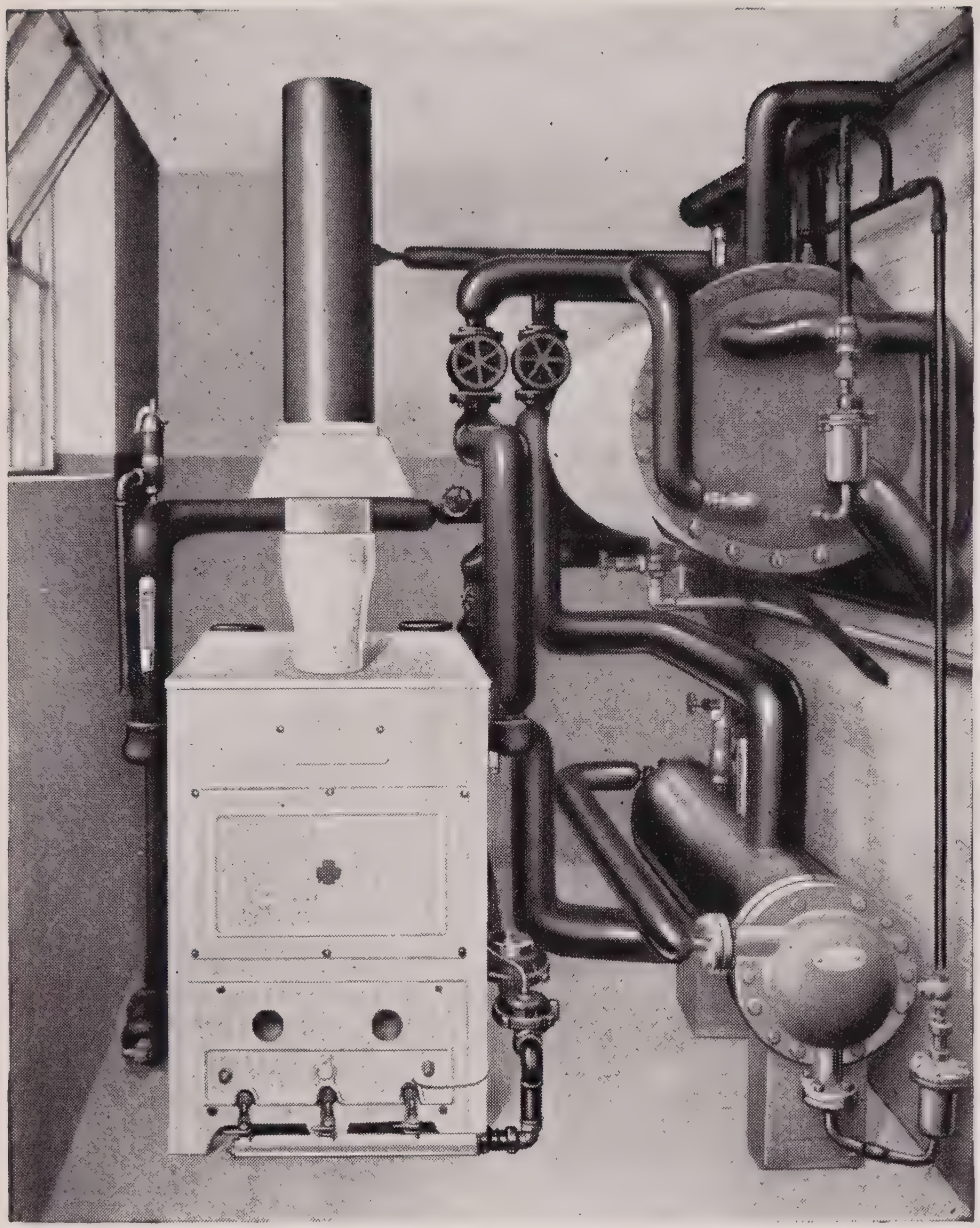

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Dawn in the Village

Photo by S. Hall

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AUGUST
1936

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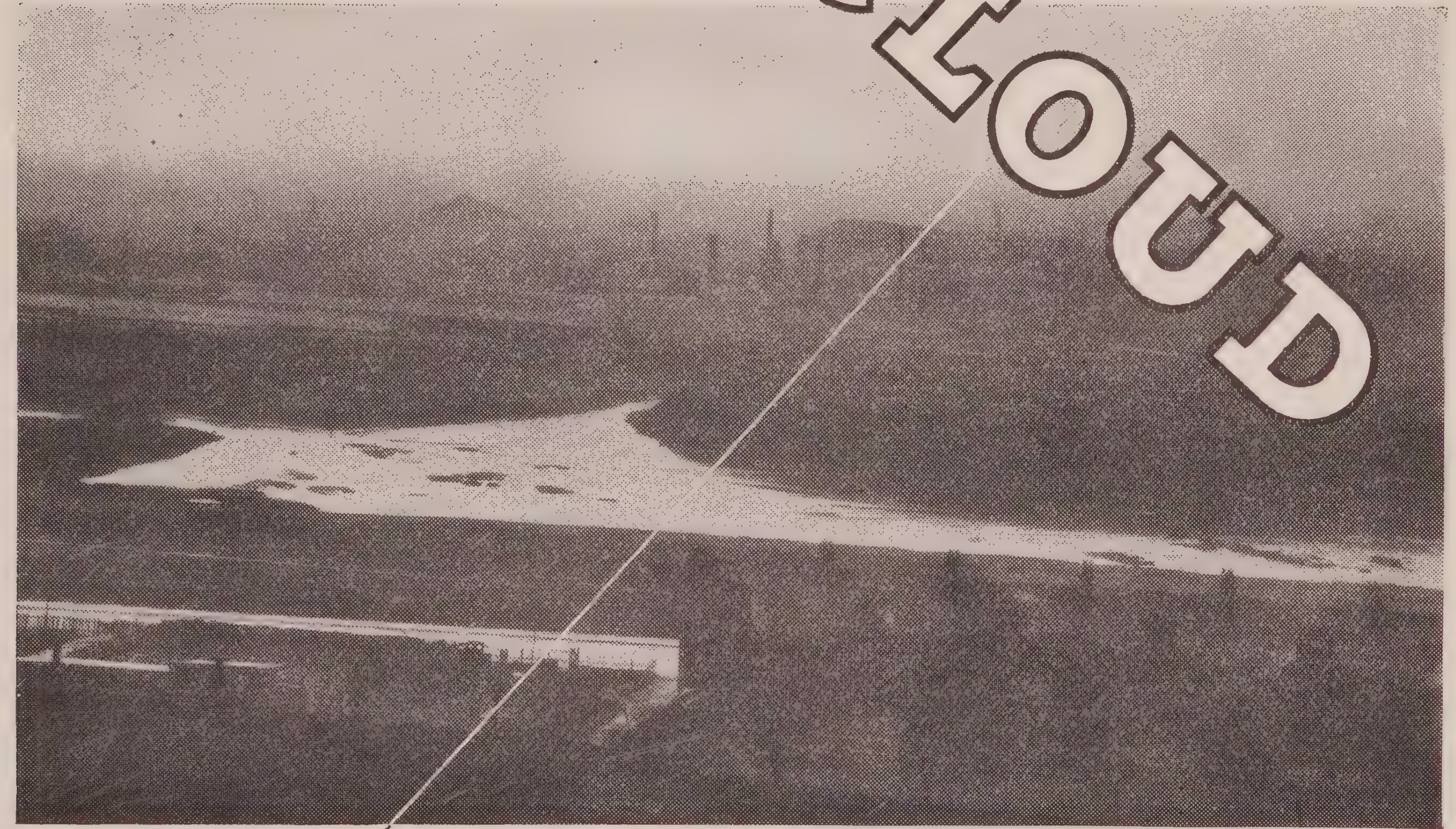

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The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.

SMOKE AT SOUTH KENSINGTON

This is the last issue of the *Journal* to be published before the Exhibition and Conference at the Science Museum in October. It will be on sale at the exhibition bookstand and will, we hope, be read by many for the first time. These events are the most impotrant of their kind for smoke abatement for a long time ; since, perhaps, the great international exhibition at the Agricultural Hall in 1912 ; and the movement is honoured by the privilege that has been accorded to it in being allowed to hold an exhibition under the aegis of the Museum. It is to be hoped that, when it is opened, the exhibition will be found to be worthy of and in harmony with the adjoining halls, in which are gathered together unique records of the achievements of science.

Although smoke abatement began as a protest and is primarily a social question, there can be no place more appropriate for its furtherance than the Science Museum. Like other reforms the purification of the atmosphere requires the understanding and support of those who are directly affected by it, but it requires also the application of scientific knowledge. Smoke abatement can be called an ideal, but it can also be called a problem of applied science.

Science, especially at times like the present, is sometimes regarded as a power that may bring not only good, but evil to humanity. True, it makes it possible for man to destroy himself and his works more effectively, but that is not the fault of science but of those whose knowledge outstrips their wisdom. Science in itself, like all knowledge, is good, and through science and its wise application to human needs must come that richer life towards which the world is hopefully struggling. That era of true civilization will possess many things which we today have only imperfectly or in small measure. Among them will be an atmosphere as clean and as healthy in the cities as in the heart of the countryside. An easy task, it must be admitted, compared with some that need the help of science.

Science, indeed, has already done much to purify our air. It has done far more than has yet been translated into practice. That spirit of investigation, which is the mother of science, has for long concerned itself with that common but mysterious mineral which is hidden beneath our land and which is the unfortunate cause of all the trouble—coal. There has been a smoke nuisance in this island since first coal began to be used, and it has been simply due to the fact that coal

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could be usefully employed under almost any conditions, no matter how faulty. If, on the one hand, its nature had been such that it would burn not only easily but completely, there would have been no smoke problem ; or if, on the other hand, it would not burn at all in the crude state, so that its use would have had to be based upon scientifically devised processes, again there would have been no nuisance. As it happens, it was found that coal burned nearly as easily as wood, and incidentally like wood gave off a smoke. It was however soon found that the smoke from the new fuel was very different from that from the old, and as wood became scarcer and coal more plentiful, indignant and strongly-expressed complaints about the dreadful nuisance began to be made, especially in London, the one large city and centre of manufacture. But the complaints came too late, or the nuisance grew too pervasively. Coal would burn where once wood burned ; any hearth and any furnace would do. Any child could make a coal fire. Science had not advanced sufficiently to suggest any better method of utilizing the precious mineral, and so the uncontrolled burning of coal in primitive appliances continued to grow and become an institution, and the accompanying smoke pall also continued to grow until it too became an institution, deplorable to the sensitive but as inevitable as the plague.

And then, out of the mists of alchemy, science began to move forward. The age of inquiry began. The nature of combustion began to be understood, the growth of industrial operations began to demand a better technique, and new ways of using coal began to be suggested. As early as 1660 John Evelyn was interested in experiments—at Greenwich—on the *charking* of coal, and again in 1772 a new edition of his " Fumifugium " urged, in the preface, that this treatment of coal should be made the subject of strict inquiry so that the fuel might be rendered smokeless. Only twenty years after this William Murdoch first distilled coal and used the gas as an illuminant. That was the beginning of the gas industry ; a revolutionary method of using coal.

Not long afterwards, experimental work, that at first could not be imagined to have anything to do with coal, was being quietly carried out, and in the genius of Faraday was the beginning of electrical power. This, in this country, is almost entirely a transmutation of the energy of coal. Years later, in the present century, a new method of using coal, rich in possibility, was placed to the credit of Thomas Parker, the founder of low temperature carbonization.

On advances in the combustion of coal it is difficult to single out names, although it is interesting to note that as early as 1776 Benjamin Franklin had fully grasped the essential problem when he wrote a letter on advance to Matthew Boulton, who was afterwards partner to James Watts. " I would only repeat to you the hint that I gave of fixing your grate in such a manner as to burn all your smoke," he writes. " I think a great deal of fuel would then be saved, for two reasons. One that smoke is fuel and is wasted when it escapes unflamed. The other, that it forms a sooty crust on the bottom of the boiler, which crust, not being a good conductor of heat, and preventing flame and hot air coming into immediate contact with the vessel, lessens their effect in giving heat to the water." From this we have advance after advance in the control of combustion and the utilization of heat, until we come to the heights of present achievement—the boiler-houses of the new power stations.

Science is harnessing coal as it is harnessing other forces. It is teaching us how to extract the maximum power from coal ; to use it to the utmost ; to use even that which would otherwise be smoke. In harnessing coal it is conquering smoke.

But alone it cannot solve the problem. It is not a power in itself but a method. It is a key ; but keys have to be turned even when they are in their locks. At the Science Museum the key will be displayed under the most favourable conditions and in the most appropriate surroundings. May therefore the occasion add much to the growing force that before long will be able to turn the key and open the door : the door which has been so strongly locked that it is difficult to believe it keeps us only from that very simple thing, fresh air.

Colwyn Bay.

The Annual Report of the Medical Officer for Colwyn Bay, Mr. William McKendrick, referring to smoke abatement states : " There was no need to take action against factory chimneys in Colwyn Bay. There is more cause for complaint against householders who burn refuse in their gardens and who recklessly use coal on fires. It is time the coal merchants embarked on a campaign of teaching their customers how to burn coal economically and smokelessly. Until they do so, I must advocate the use of gas and electrical heating."

The Royal Sanitary Congress.

A paper on " Atmospheric Pollution—the Present Position " by Mr. C. M. Opie, Chief Smoke Inspector, Liverpool, was read at the Congress of the Royal Sanitary Institute at Southport in July. Mr. Opie is the author of the article on the position in Merseyside and District, which will be found on another page. It is hoped that it will be possible to refer to his paper at greater length in the next issue.

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MR. F. FORREST'S ADDRESS

As stated in the May issue of the Journal, the report of the address given to the members of Society on the occasion of their visit to Birmingham on April 2nd, was held over so that it might be printed in full. Mr. Forrest, Chief Engineer and Manager to the Birmingham Electric Supply Department, not only made the arrangements for a most instructive visit, but went to considerable trouble in preparing a full description of the plants, and the problems which brought about their introduction, which was read at a meeting held in the morning. The address was followed by an interesting discussion in which members took part. The meeting was presided over by Dr. R. Lessing.

Mr. Forrest's paper was as follows:

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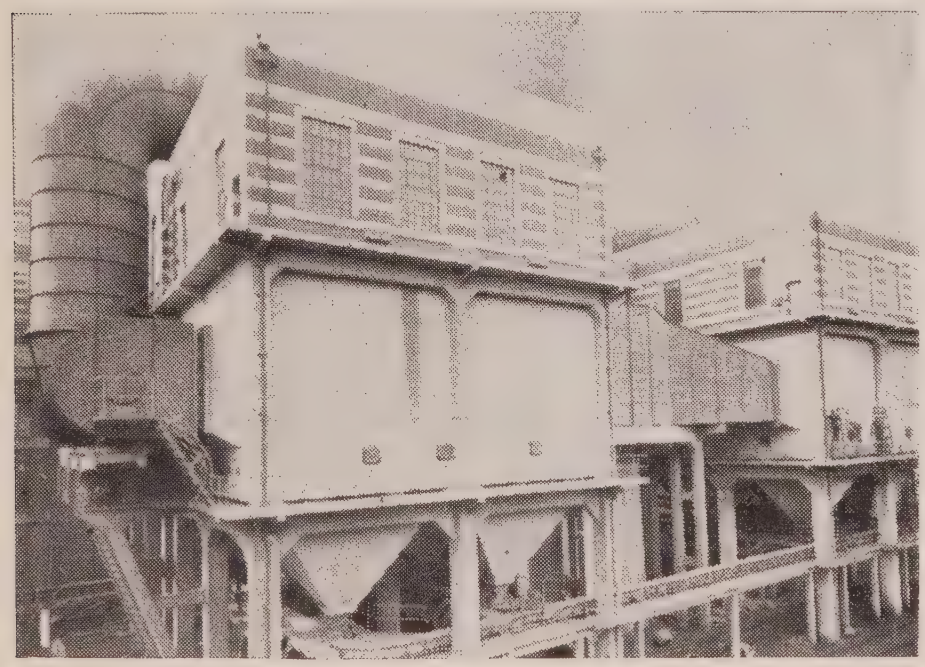
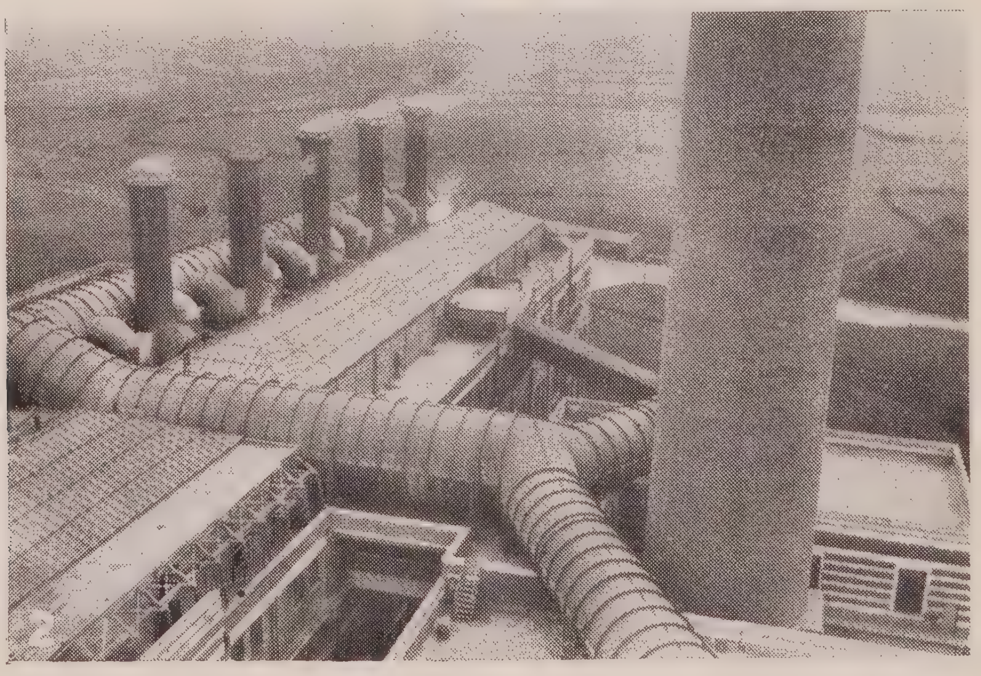


The electro-filter structure and flue-gas ducts at Hams Hall.



The ducts connecting the boiler outlets to the electro-filter chambers at Hams Hall.

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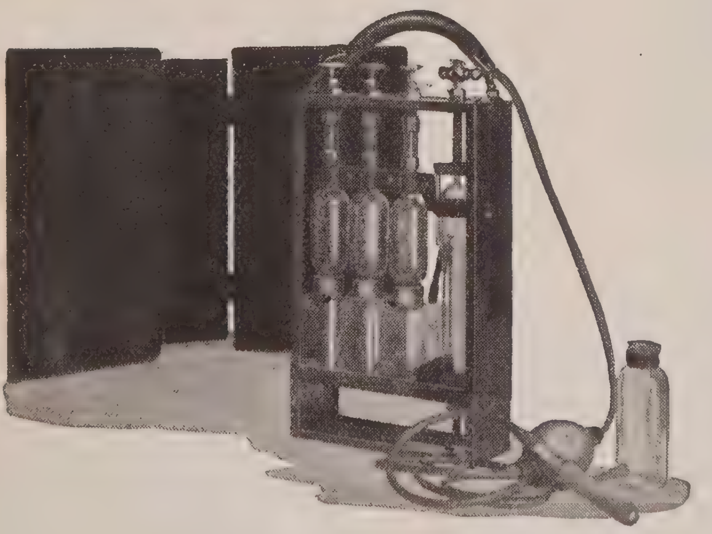

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service between 1922 and 1931. The steam for these is supplied by 25 water tube boilers, the four largest of which are fired by pulverized fuel, whilst the remainder are fired by mechanical stokers. Both forced and induced draft is used.

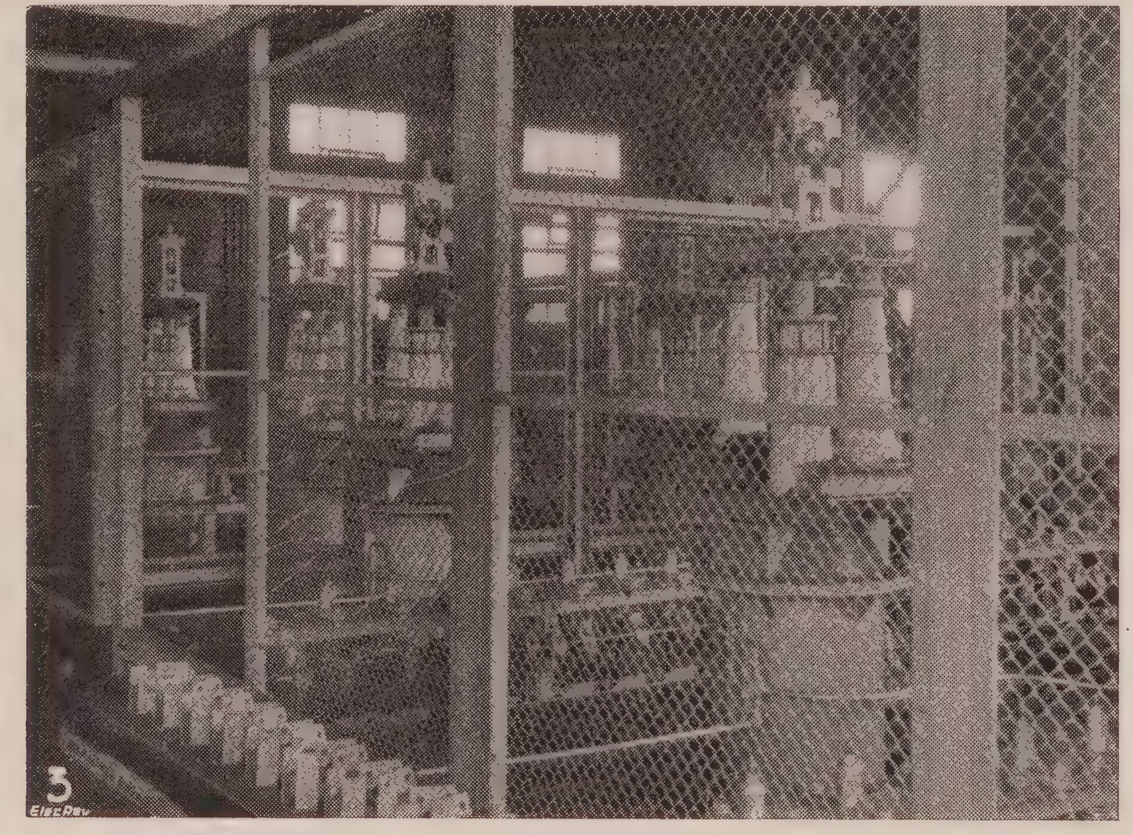
The rate at which fuel was consumed at this Station during last winter amounted to 85 tons per hour, of which 31 tons per hour was in the pulverized form.

The plant at present installed at the Hams Hall Station totals 90,000 Kw. (or, say 120,000 HP.) put into service between 1929 and 1931, but extensions are now in hand which will increase the plant capacity to 240,000 Kw., or 320,000 HP. by 1937.

At the Prince's Station, Nechells, the flue gases were discharged to atmosphere through steel chimneys supported on the Boiler House roof, the total height of the chimneys above ground level being 146 feet.

At Hams Hall Station the same general arrangement of chimneys was in use, the total height of the top of the steel chimneys being 136 feet above ground level.

Between the boilers and the chimneys centrifugal type grit arrestors are installed, which proved highly efficient in the case of mechanically steam fired boilers, but which were not nearly so efficient with the very fine dust discharged from the pulverized fuel fired boilers. This very fine dust from the pulverized fuel fired boilers, which escaped to atmosphere through the centrifugal grit arrestors, was found to fall some little distance from the Station in sufficiently large quantities to create a nuisance, and gave rise to complaints.



The rapping gear and electrode insulators above the electro-filter chambers at Nechells.

Steam is at present supplied by six very large water tube boilers, each having an evaporative capacity of 200,000 lbs. of water per hour, and each of these is fired with pulverized fuel. Two more similar boilers are now being added.

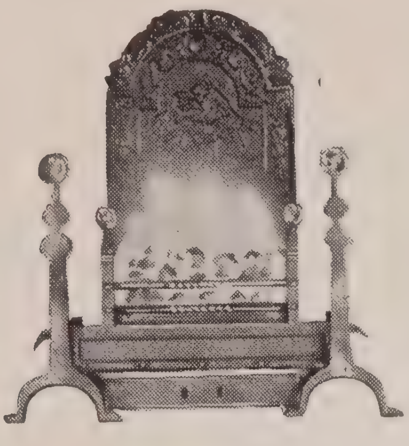
The rate at which coal was consumed last winter amounted to 70 tons per hour. When the new pulverized fuel boilers are in service this will increase to 100 tons per hour.

The coal used at both Stations is a mixture of fines and slacks of rather poor quality, obtained from various Midland Collieries, having an average ash content of 13.5%.

Samples of all coals received are tested by a staff of chemists in well-equipped laboratories, whilst the combustion of the fuel under the boilers is controlled by a staff of combustion engineers, to ensure maximum efficiency.

Until better means could be evolved for dealing with the trouble, a good class coal with a lower ash content was temporarily substituted for the kind generally used, and this did something towards solving the difficulty. Similar trouble was being experienced by Power Stations in other parts of the country, and it will be within the knowlenge of those present that the Electricity Commissioners appointed a Special Technical Committee to investigate the whole problem and to report making recommendations as to how best it could be cured.

Pending the publication of this Report, no large expenditure on curative means could be agreed to by the Birmingham Electricity Committee, but in the



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meantime I had the opportunity of visiting large Power Stations both in America and Germany, and other parts of the Continent, to investigate what was being done in those places. The Commissioners published the Report of this Technical Committee in November, 1932, the principal recommendations and observations being as follows :—

(1) The most suitable type of dust extraction plant for pulverized fired installations is the electrostatic precipitator. The use of water for dust extraction purposes has certain disadvantages (especially corrosion unless costly precautions are taken) and is therefore not recommended.

(2) Where certain conditions of design and operation are observed no dust extraction plant will be necessary with mechanical stoker fired installations, but where these conditions do not exist the multi-cyclone (or centrifugal) type of dust extraction plant will be found to be suitable.

(3) The minimum height of chimneys should be 2½ times the height of the highest point of the generating station buildings, plus an allowance to be made for other local conditions where necessary.

Gases discharged from chimneys having the height now suggested will enter into an air stream which can be depended upon not to come in contact with the earth under normal conditions.

(4) The ash content of coal has an important bearing on the dust loading of flue gases, and it is therefore obvious that the use of coal with low ash content would simplify the dust problem, and that some special system of cleaning coal may ultimately prove an important factor in avoiding the nuisance.

I am glad to record that the conclusions and recommendations of this Committee coincide almost exactly with the information and advice I was able to obtain during my visits abroad, where I had seen similar apparatus at work and the benefits of high chimneys fully demonstrated.

The Birmingham Electricity Committee therefore, immediately after the publication of this Report, gave instructions for plans and specifications to be prepared, and tenders and guarantees obtained for the installing of Electro-Filter Plants combined with high chimneys as recommended in the Report, for use in connection with the pulverized fuel fired boilers only both at Prince's Station Nechells and Hams Hall, the existing centrifugal grit arresters being used alone on the mechanical stoker fired boilers at Nechells.

I will endeavour to give a brief description of the design and arrangement of the high chimneys and electro-filter plants now installed and in service in connection with the pulverized fuel fired boilers at the two Stations.

Chimneys—Princes Station Nechells.

As the maximum height of the station buildings is 110 ft., and working to the recommendations contained in the Report already referred to, an unlined brick chimney 350 ft. high and 15 ft. internal diameter at the top has been constructed and is now in use. It weighs 4,200 tons and its base is spread over an area of 950 sq. ft.

Owing to the nature of the subsoil ferro-concrete piles were driven to an average depth of 25 ft., and on these the chimney with its foundations is supported.

Hams Hall.

The maximum height of the buildings at this station is 103 ft., and the two chimneys each 350 ft. high and 20 ft. internal diameter at the top will be required. The first is in service now, whilst the second is about half completed. Both are built of brick and the weight of each chimney is 5,200 tons. They stand on mass concrete foundations.

Flue Gas Ducts.

One of the major problems consequent upon the installation of the electro-filter plants and the use of the new high brick chimneys, was the conveyance of the boiler flue gases from the existing boilers to the new flue gas cleaning plant, and the taking out of service of the existing sheet steel chimneys whilst the stations were in full operation.

At each Station it was decided to construct circular gas ducts of mild steel plates ¼″ thick, stiffened and strengthened internally, and to support these on the Boiler House roof in such a way that the gases from the existing boilers could be turned into it by means of dampers.

This duct at Hams Hall will be 300 ft. long and of varying internal diameters up to a maximum of 19 ft. so that the problem of expansion stresses due to changes of temperature was a very important one to work out.

The steel ducts are covered internally with heat insulating cement-like material, which up to the present has proved very effective.

At Hams Hall the original steel chimneys are being retained and can be used in case of need, two-way dampers being provided on each boiler to divert the boiler gases either into the new steel duct or into the steel chimneys.

Electro-Filter Plants.

The Contractor was required to guarantee that the efficiency of dust collection of the plants at Nechells and Hams Hall would be not less than 90% and 92% respectively when operating at their full duty, whilst the dust content of the inlet gases is one grain per cu. ft. and 1.25 grains per cu. ft. respectively at the actual

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temperature entering the plant, i.e., the dust content of the outlet gases after passing through either plant should not exceed 0.1 grain per cu. ft. corrected to the temperature of the gas entering the plant.

In addition the Contractor was called upon to supply a graph showing curves of minimum anticipated performance and efficiency at other rates of gas flow.

As the electro-filter plant works in series with the original centrifugal type dust arresters, which are known to have an efficiency of 75% at Nechells and 65% at Hams Hall, the total efficiency of dust elimination between the boiler and the atmosphere will be at least 97.5% at Nechells and 97.2% at Hams Hall.

The maximum quantity and temperature of the dust laden gases to be treated by the two electro-filter plants was specified to be :—

At Prince's Station, Nechells ..	396,000 cu. ft. per min. at 388° F.
At Hams Hall	880,000 cu. ft. per min. at 315° F.

The approximate size of the grit and dust particles to be dealt with by these plants was specified to be as follows :—

	NECHELLS	HAMS HALL
Over 63 microns diameter ..	2% to 7%	2% to 10%
Between 50 & 63 microns dia.	1% to 3%	2% to 5%
„ 40 „ 50 „ „	2% to 4%	2% to 6%
„ 30 „ 40 „ „	2.5% to 8%	3% to 8%
„ 20 „ 30 „ „	4% to 15%	4% to 14%
„ 10 „ 20 „ „	7% to 25%	8% to 27%
Less than 10 microns dia. ..	50% to 75%	50% to 75%

Treater Chambers.

Four separate reinforced concrete chambers are provided, mounted on roller bearings and free to move, which receive the whole of the flue gases, and in which the dust collecting electrodes are installed, but any of these separate chambers can be isolated by means of inlet and outlet dampers, when the load on the boilers falls or for the purpose of cleaning or carrying out necessary repairs whilst the rest of the plant remains in service.

The gases normally pass horizontally through the four chambers in parallel on their way to the chimney.

The chambers are constructed with hopper bottoms into which the dust after being caught is collected. These collecting chambers are fitted with valves so as to enable the dust to be removed by mechanical means or by water sluice.

Each electro-filter chamber houses four banks of vertically suspended and electrically charged electrodes arranged in alternate rows, forming as it were curtains through which the gases must pass. The negatively charged electrodes are built up of rods about ¼″ diameter spaced about 5″ centres, the distance between the rows being 10″. Twenty rows with 13 electrodes in each are provided in each bank.

Situated midway between the negatively charged electrodes are positively charged electrodes.

The rows of positively charged electrodes upon which the dust collects consist of tubes ⅜″ total diameter spaced at 2″ centres with 10″ between the rows.

Each bank of collecting electrodes has separate individual rapping gear electrically operated by motors which has collected and which then falls into the collecting hopper below.

The rapping hammers themselves are of the cam operated type, spring loaded and driven by chain gearing.

The electrodes are energized by direct current having a voltage of about 40,000v.

Transformer House.

The electrical control equipment for the operation of the plant is installed in a separate building remote from the treater chambers, and comprises three complete rectifying units with transformers. Two of these units are always in operation, while the third acts as standby.

By a suitable arrangement of switches any rectifying unit may be switched on to either of the groups of electrodes, but no two rectifyers are operated together with the same bank of electrodes.

Each rectifying unit is equipped with a complete control panel, on which are mounted all necessary instruments and meters for indicating when the plant is operating with the correct polarity, and the voltage and amount of current taken.

Audible warning of the operation of an automatic circuit breaker which would cut off the supply to the electrodes is given by a Klaxon horn situated on the electrostatic plant itself, so that should a rectifier for any reason automatically trip out due to fault or otherwise the attendant's notice is quickly drawn to the fact.

Safety interlocking arrangements are provided to ensure that access cannot be obtained to any of the high voltage rectifying units which are alive.

Theory of Electrostatic Precipitation, and Principle of operation.

The electrostatic method of cleaning flue gas depends for its operation on the ionization of the gases under treatment by the brush or corona formed between electrodes maintained at a high difference of potential.

In the Lodge-Cottrell plant, as in use at Nechells and Hams Hall, the electrode from which the discharge takes place is always of negative polarity, and the suspended dust particles becoming negatively charged by the bombardment of the electrons in the ionized gas are repelled by the negative electrode, and attracted and deposited upon the positive electrode.

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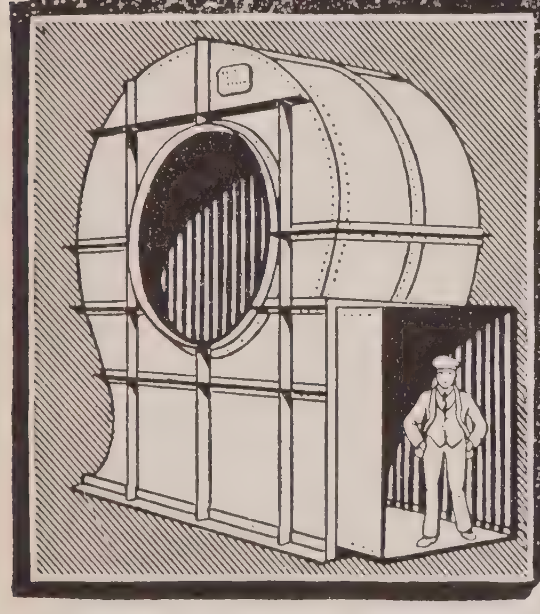

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THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible. Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

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Owing to the difficulty of generating direct current at the potential required, i.e., 40,000 volts, the supply to the electrodes is obtained from a special single-phase oil immersed transformer having a voltage ratio of 400/60,000 at 50 cycles per second, which, by means of voltage regulators on the primary side, delivers high tension current at the requisite pressure to a motor driven rectifier.

This rectifier consists of a rotating insulated disc mounted on the shaft of a synchronous motor running at a speed of 1500 r.p.m. Close to the periphery of the disc are four stationary terminals spaced 90° apart, the top terminal being connected to the high tension lead to the electrodes, the bottom terminal being earthed, while the two horizontally-mounted terminals are connected to the high tension winding of the transformer.

On the edge of the rotating insulated disc are fixed four contacts 90° apart, adjacent pairs being connected together, which during rotation periodically bridge across adjacent pairs of stationary terminals so that unidirectional impulses are received in the high tension lead to the electrodes.

Suitable choke coils are employed to limit the effect of surges in the high tension circuit.

Method of Testing.

The most accurate method of determining the efficiency of this type of plant is to weigh the dust caught and determine if possible the amount of dust leaving the plant in the outlet gases, the sum of these two quantities representing the total dust offered to the plant, and the ratio of the dust caught to the total dust offered to the plant being the overall efficiency.

Those who have endeavoured to test flue gases for dust quantities know how extremely difficult this problem is, and what wide inaccuracies can creep in due to change of shape of the duct, change of direction of flow of the gases, and factors of that sort. Up to the present, although a great many tests have been carried out by us, we have not obtained any sufficiently reliable results at the present time, and tests are still continuing. Gradually we hope to obtain figures which will be approximately correct.

We have found among other things that the proper place for sampling flue gases going to atmosphere would be well up in the chimney itself after the gases have followed a parallel path for a considerable distance, and it is interesting to note that the Electricity Commissioners now require test points to be incorporated in brick chimneys during construction, for taking samples of the flue gases.

Even in the chimney, however, it is by no means certain that the gas is entirely free from turbulance and thoroughly mixed, especially where more than one entrance into the chimney is provided, as is the case both at Nechells and Hams Hall.

From the quantity of very fine dust which we are now catching, and which previously went to atmosphere, the overall efficiency and results obtained with the electro-filter plant must be up to the efficiency guaranteed, although as stated above, we have not yet got figures of sufficient accuracy to quote at the present time.

I think it will be agreed that the Birmingham Electricity Committee showed commendable civic spirit in authorising the large expenditure (amounting to nearly £175,000) on gas cleaning plants and high chimneys etc. for their two principal Generating Stations, with a view to preventing as far as possible the pollution of the atmosphere in the neighbourhood of those Stations.

"City and Guilds" Examinations.

The results of the examinations in Boilerhouse Practice of the City and Guilds of London Institute, held for the first time this year, are as follows :

Number of candidates	108
Pass, 1st Class	37
2nd Class	45
Fail	26

The examiner stated that the standard attained by many of the candidates was exceptionally high. The Society, and the Regional Committees, are represented upon the Institute's Advisory Committee for this subject.

Association of Technical Institutions.

A paper on the smoke problem was presented by Dr. H. A. Des Voeux at the three days' summer meeting of the Association of Technical Institutions held at Bath at the end of June. The paper created a lively discussion and was widely commented upon in the Press.

A New Ultra-Violet Ray Meter.

For several years daily observations of ultra-violet radiation were carried out at the Society's offices on behalf of Dr. J. R. Ashworth, a member of the Executive Committee and the author of many publications on atmospheric pollution. Dr. Ashworth's original apparatus has now been developed and is being manufactured by Messrs. Negretti and Zambra. The apparatus aims at simplicity, ease of working and of recording, and consists essentially of a series of graded screens which progressively cut off the U.V. radiatiation that has previously passed through a plate of glass that is opaque to all other rays. The passage of the rays through any section of the screens is recorded upon a strip of sensitized paper, and the strength of the radiation is indicated by the extent to which the paper is marked. The instrument will measure the intensity of radiation with reasonable accuracy from 0.1 to 1,604 in arbitary numbers.

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The third article in a series of regional reviews.

SMOKE PROBLEMS AND ACTIVITIES ON MERSEYSIDE

By C. M. OPIE, Chief Smoke Inspector, Liverpool.

The Merseyside area has a population of approximately 1¾ million people, there are 400,000 houses and 1,300 industrial chimneys. The principal industries are shipping, shipbuilding, engineering, sugar-refining, tanning, soap-making, flour-milling and glass making. Liverpool, the centre of this area, has a place in smoke abatement history, for as far back as 1846 powers under a local act were obtained, to deal with industrial smoke.

In spite of the fact that industrial smoke has been reduced by at least 75 per cent, this period of legislation has not produced general improvement in atmospheric conditions to any discernible degree.

Industrial Smoke.

There are few exempted industries in the area and the main industrial smoke question concerns boiler smoke. Most of the large firms are solving their smoke problem satisfactorily; in their endeavour to reduce power costs, efficiency is demanded in the boiler-house, and this has led to the installation of mechanically controlled, modern boiler-plant, with the consequent general cleaning-up of the industrial chimneys. There is also a steadily increasing demand for combustion engineers by large manufacturers which has resulted in skilled supervision and satisfactory results being obtained from the boiler-plant available. There still remains however, the difficulty of controlling large sets of hand fired-boilers which burn cheap slack coal. I have in mind one case in Liverpool with seven Lancashire boilers (14 furnaces) and two large water-tube boilers discharging into one chimney. Allowing for the size of this plant, the smoke emission from the chimney is well controlled and rarely exceeds the limit of two minutes black smoke per half-hour. To the man in the street however, any smoke emission from an industrial chimney is looked upon as a nuisance and no allowance is made for the size or type of plant.

In regard to the numerous single boiler installations, usually of the vertical type and most common in small works and laundries, coke, or a mixture of coke and coal, is in general use as fuel, thus giving smokeless combustion with the minimum of attention. Most manufacturers are now showing greater discrimination in the selection and use of fuel with consistently better results year by year, and, although there is a wide difference between smoke reduction and smoke elimination statistics for the City of Liverpool during 1934 show that on the average industrial chimneys are smokeless for 54.4 minutes per hour, black smoke issues for 1.15 minutes per hour, and smoke of any density or colour for 5.6 minutes per hour.

One of the largest factories in the City is at present being supplied with a large proportion of its steam requirements from the corporation power station. Although this system of supplying steam from a large centralized generating plant has been in use in other countries for some time it is the first application of its kind on a large scale in this area. The extended use of similar centralized steam generating units, where a large number of firms are localized, would assist materially in minimizing atmospheric pollution and reduce production costs.

Railway Locomotives.

In October 1829 there was organized a trial race of locomotives on the Liverpool and Manchester Railway. Conditions were imposed that the engines in the trial were to be constructed so as to burn their own smoke and yet over 100 years later one of the most serious of the present day smoke nuisances arises from railway locomotives. Smoke emission from individual engines may not be black or excessive but the sulphurous fumes and smoke discharge from railway tunnels, cuttings and ventilating towers in the centre of towns, constitutes a menace to the health of the inhabitants and causes discolouration and deterioration of property in the immediate vicinity. Most towns in the country suffer in common in this respect, and it would appear that the only practicable solution of this aspect of the problem is the electrification of all trains which operate within the boundaries of large towns. This system has been adopted in New York and many other towns.

Smoke from Steamers.

Any district adjacent to a busy navigable river has to deal with an aspect of the smoke problem not experienced by inland areas, namely, smoke emission from steamer traffic. In the case of the Mersey this problem is possibly more acute than at other ports, since for considerable distances on both banks of the river there are large residential districts, whilst the commercial centres of Liverpool, Birkenhead and Bootle are situated close to the riverside. The nuisance is one which presents unusual difficulties to the inspector.

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Prevention by advice or instruction is not possible except in cases where the offending vessel is alongside a quay or dock. Prosecution has been found to be the only effective deterrent. The Liverpool Corporation has powers under local act to deal with this form of nuisance, but at present sixty per cent of the river traffic is exempt from smoke abatement legislation and extended powers are being sought to control smoke from certain classes of exempted vessels. It is not an uncommon occurrence for vessels on the river to emit excessive black smoke for a period of ten to fifteen minutes, the offenders frequently being large foreign-going steamers who, under existing legislation, are exempt from prosecution. In the case of British owned vessels, formal notices are sent to the owners when any excessive smoke nuisance is observed, even though legal proceedings cannot be taken. This is useful propaganda, for steamship owners in these days of strict economy are as anxious to prevent waste from excessive smoke as by any other means and can be persuaded to take action to prevent a recurrence of the nuisance. Foreign owned steamers however, represent a considerable portion of the shipping of the port and no action can be taken against smoke nuisance from this class of vessel.

Lectures on Smoke Abatement and Fuel Economy.

In good smoke abatement practice not only is it necessary to detect the smoke offender and where required, enforce the provisions of the various statutes, but technical advice and instruction is essential for boiler-plant owners and operators so that they may put into practice the principles on which fuel combustion, furnace management and boiler efficiency should be carried out.

During the winter months a series of lectures and practical demonstrations on Smoke Abatement and Fuel Economy are given at the University School of Hygiene, Liverpool, and during the last three years there has been an average attendance of 85 students. Many firms in the area are co-operating, as apart from the interests of a cleaner atmosphere, it is important that power costs should be reduced to a minimum and it is in the employers economic interest to facilitate and encourage the attendace of their men. These lectures and demonstrations are complementary to the general work of administration and they are designed to be useful to works managers, works engineers, stokers and others interested in the efficient and economical use of fuel. The lectures are illustrated by slides, charts and working models ; care is taken that the syllabus is not too academic for its immediate purpose. For this reason the first ten lectures are of a relatively simple character, followed by a further ten lectures of a somewhat more advanced nature. Great interest is shown by the students in practical demonstrations which are held on Saturday afternoons. Visits are made to such places as the electricity generating stations, gas works and factories and steamships where good fuel-combustion conditions obtain.

Regional Smoke Abatement Committee.

The representation of the West Lancashire and Cheshire Regional Smoke Abatement Committee extends over a large area and covers such widely separated towns as Preston and Chester. The Committee has recently completed a general survey of the extent and type of industry in the area and has published a handbook on smoke abatement and fuel economy. One thousand copies of this handbook are being distributed to manufacturers and boiler-plant owners. It may be said that although acting in an advisory capacity only, this committee is doing very valuable work in conducting forceful propaganda and encouraging the use of smokeless heating agents. It is to be regretted however, that few of the constituent authorities have adopted the bye-law dealing with the emission of black smoke from industrial chimneys. This lack of co-operation complicates the effective control of boiler smoke, indicates a lack of uniformity in practice and of interest on the part of local authorities generally. Perhaps one of the main causes of this state of affairs may be found in the fact that many constituent areas are too small industrially to justify employment of even one inspector. This sometimes results in smoke abatement being regarded as of secondary importance, whereas actually, nothing would repay a community better than close attention to the smoke problem.

Domestic Smoke.

The smoke from domestic chimneys constitutes the major part of atmospheric pollution in this area and concentrated effort is needed to abate this important factor in the problem. During the winter months there is poured into the air 1,200 tons of soot and 250 tons of sulphuric acid every week from the burning of 20,000 tons of coal in domestic fires in the City of Liverpool. The red sandstone of the Cathedral and the stonework of all our new buildings becomes impregnated with carbonaceous tarry matter and their exterior architectural beauty will in time, like the older buildings, take on that wrapping of dull black hue which covers the buildings of all our industrial cities. In the winter time the smoke pollutes the atmosphere to such an extent that visibility at street level is seldom more than 150 yards. The man in the street does not require scientific data to convince him that the air is polluted. He notices the exclusion of sunlight, the constant accumulation of dust in the homes of the people, the dirty clothes and the sulphurous tasting atmosphere during periods of fog.

Domestic smoke is largely a woman's question ; the greatest part of the housewife's life is spent in fighting dirt, yet few women realize that they themselves are responsible for a considerable amount of dirt that they strive so hard to remove.

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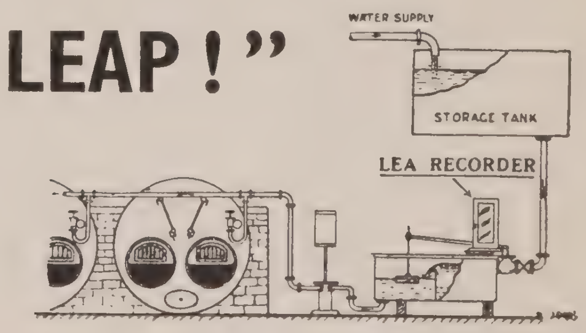
"LOOK BEFORE YOU LEAP!"

Before making any alterations to your Boiler Plant, it is advisable to ascertain the actual facts of your existing plant———



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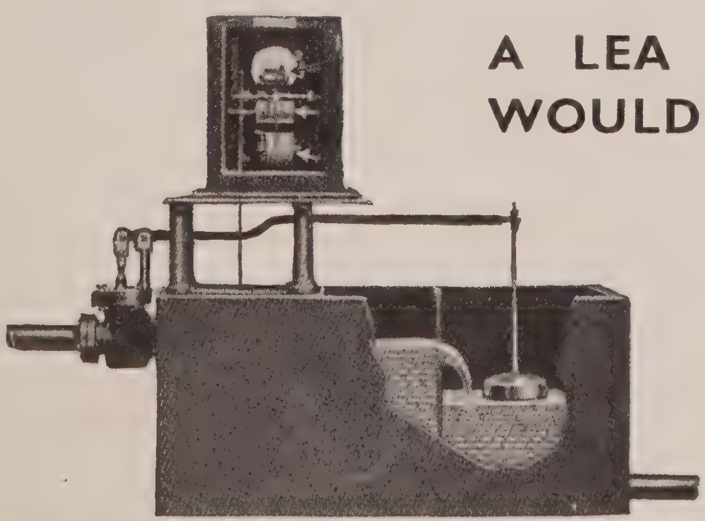

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Progress in domestic smoke abatement is certainly being made. The electric and gas industries show in their returns that considerable progress is being made in heating and cooking by these smokeless media. On the new housing estates, comprising over 30,000 houses, under the control of the Liverpool Corporation, there are more than 130,000 appliances supplied by the gas and electric industries.

According to the public demand however, there appears to be no satisfactory alternative to the open fire for the living room, therefore an essential part of the work of smoke abatement is to increase the use and availability of solid smokeless fuels. In this area various satisfactory solid smokeless fuels are available, including the locally manufactured 'Dryco' and all have a steadily increasing sale. One factor operating against the adoption of solid smokeless fuel is the large number of old-type, inefficient and wasteful kitchen ranges that discharge into chimney flues so large that efficient draught is impeded. This type of kitchen range is very common in pre-war built houses and a conversion set that would enable them to burn coke or other smokeless solid fuel satisfactorily would effect a big reduction in the smoke emission from domestic chimneys.

It is encouraging to note that well prepared, dry domestic coke is now supplied by the majority of gas companies and is finding a ready sale for use in grates suitably designed for burning coke and for use in ordinary grates when mixed with bituminous coal.

In general, progress in domestic smoke abatement is being made on the following lines :

(1). The installation in new houses and offices of grates suitable for burning coke, together with inducements to use gas or electricity for cooking, and for heating purposes in rooms where a regular fire is not required.

(2). The conversion, where practicable, of ordinary open grates to a design suitable for burning any solid smokeless fuel.

(3). The promotion of facilities for the sale of coke and other solid smokeless fuels in small quantities.

Firing Domestic Chimney Flues.

The too common habit of cleaning domestic chimneys by deliberately setting fire to them constitutes a special problem of selfishness and indifference to the comfort of others that deserves much more drastic treatment than it usually receives. Educational work and forceful propaganda is being instituted against this practice, so that the conscientious housewife will show a thoughtful sense of communal responsibility and neighourly consideration when the resultant harm is demonstrated to her.

REGIONAL COMMITTEE NEWS

In this issue and each subsequent issue a page or more will be devoted to news of the current activitities of the Regional Smoke Abatement Committees. By this means not only will readers be kept informed of such activities, but the members of the various committees will be able to keep in touch with the general progress of this important form of organization among our local authorities. Up to now no medium for the exchange of information between the committees has been possible, and it is hoped that this section of the Society's *Journal* will be of real service to their members.

The West Riding of Yorkshire.

At a meeting of the Committee held in Leeds on June 12th the resolution passed by the National Smoke Abatement Society at its Bristol Conference, 1935, on the "exemptions clause" of the act of 1926, was considered. A communication on the same subject had been received from the Sheffield, Rotherham, and District Committee, and was also considered. As a result the following resolution was passed :

"That this Committee is of the opinion that the time has now arrived when serious consideration should be given to the desirability of the qualified exemption enjoyed by certain industries under the Public Health (Smoke Abatement) Act, 1926 being withdrawn."

Copies of the resolution have been forwarded to the Minister of Health and other interested bodies.

At an earlier meeting of the Committee it was agreed to invite the co-operation, which had been promised, of the two H.M. Inspectors of Alkali, etc., Works for the area covered by the Committee.

The Annual Conference of the Committee was held on 3rd July, and it is hoped to include a report of this in the next issue of the *Journal.*

Sheffield, Rotherham and District.

The Committee meets monthly, and, being a statutory body has for its principal business the consideration of the work of the staff. A report is also presented by the Chief Inspector on the observation made in the investigation of atmospheric pollution, including deposits, tar, sulphur (by the lead peroxide method), and ultra-violet radiation.

At a recent meeting it was reported that the classes for furnacemen and stokers held during the last session had been attended by about 70 students. Of the 30 who sat for the examination 23 were succesful.

West Lancashire and Cheshire.

The lectures on smoke abatement and fuel economy at the Liverpool School of Hygiene were well attended during the winter session, 58 students having enrolled.

HEALTH RESORT

AT BUXTON, as at all resorts similarly given over to the promotion of good health, purity of atmosphere amounts to stock-in-trade. In the choice of modernized gas works equipment a very big factor was the necessity for smoke-free operation. And, as at many other health centres, the chosen carbonizing plant was an installation of

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The course is divided into ten elementary and ten more advanced lectures. Manufacturers in the area are co-operating and practical demonstrations are given to the students at various factories.

Great interest has been aroused by the development, by private enterprise, of a housing estate in Liverpool, where open fires, suitable for using domestic coke as fuel, are being installed as standard fittings for cooking and heating. Various delegations have visited the estate, and an inspection was made by members of the Committee after a recent meeting, when the grates and smokeless fuels were demonstrated and explained by the Chairman (Councillor W. T. Lancashire, Liverpool).

At the Annual Conference held on 17th June, the Honorary Secretary (Dr. W. H. Frazer, M.O.H. Liverpool) reported that the Executive Committee had dealt with replies received from constituent authorities to a questionnaire relating to (*a*) standard deposit gauge, (*b*) grit emission and housing, and (*c*) uniform bye-law, instruction cards and propaganda.

The Executive Committee has considered the enlargement of the Committee and has invited a number of other authorities to become members.

Believing that much of the industrial smoke emission in the area is caused by the lack of knowledge concerning fuels and furnace management, the Committee has issued an excellently produced handbook entitled " Smoke Abatement and Fuel Economy in Industry." This is to be distributed to manufacturers in the area, or single copies may be purchased at the price of sixpence. Its scope is shown by the sections into which it is divided : Fuels and Combustion—Boiler Management—Methods of Hand Firing—Mechanical Stokers—Fuel-Saving Devices. A reproduction of the excellent " Boiler Efficiency " chart of the Federation of British Industries, Fuel Economy Department, is included

Manchester and District.

At a meeting held in Manchester on 3rd July, Alderman W. T. Jackson was re-elected Chairman, Councillor R. H. Cunliffe Deputy Chairman, and Dr. R. Veitch Clark Hon. Secretary.

A new member of the Executive Committee is Mr. H. G. Howson, H.M. Inspector of Alkali Works, who has been co-opted on the Committee as a result of a communication from the Ministry of Health pointing that the Alkali Department is now to act as a liaison between local authorities and the Ministry in matters relating to smoke nuisances. Mr. Howson stated that the Alkali Inspectors, by nature of their work, have an entry in the industrial field from quite a different angle to that possessed by local authorities. This different relationship, based as it is upon a knowledge of industrial processes, might facilitate the work of smoke abatement. Mr. Howson explained that any efforts of his would be of an advisory helpful nature and not administrative.

The Committee agreed to co-operate with the Coal Utilisation Council, through their Area Combustion Engineer, Mr. D. P. Kirkman, with a view to prevention of smoke from works and factories in the area of the Committee. Mr. Kirkman has offered to visit any works, etc., in the district and to advise as to steps to be taken to minimize smoke emission, without any charge. The Commitee were informed that a number of the authorities had circulated the firms in their areas and already 17 applications for investigations had been made and carried out satisfactorily.

For some time the Committee have been considering the proposed formation of a Joint Smoke Abatement Board for South-East Lancashire. An exhaustive statement on the subject has been approved by the Regional Committee and some of the authorities have already signified their willingness to join the board if it is formed. It is hoped that in a short time a full conference of all the authorities within the regional area will be called with a view to proceeding further in this matter.

Mr. S. N. Duguid reported that 14 students attending the classes in Boilerhouse practice at the Manchester College of Technology had entered the first examination held by the City and Guilds of London Institute. Seven passed in the first class, five in the second, and only two failed.

The Committee elected two delegates to attend the Annual Conference of the National Smoke Abatement Society to be held at the Science Museum, South Kensington.

Reference was made at the meeting to the resignation from the Executive of Mr. R. Morton Rowe, who had been a member of the Committee since its inception. A tribute was paid to Mr. Rowe, who was formerly Chief Smoke Inspector to the Manchester Corporation, for the valuable services he had rendered the Committee.

(We regret to learn of Mr. Rowe's resignation, and should like to join in the tribute paid to him. He was for many years a valued member of the Executive Committee of the Society, and his wide knowledge of the subject was always at our disposal.—*Ed.*)

Northumberland and Durham.

At a meeting of the Northumberland and Durham Regional advisory Committee held in Newcastle on 3rd June, the chief subject of discussion was the nuisance arising from the burning of pit heaps. A resolution was passed expressing to the Minister of Health the desirability of the disposal of pit heaps. Disposal by returning to the pit, or by depositing in the sea, were among the remedies suggested. Alderman Adams, M.P. who presided, said he had asked a question in the House of Commons and the Minister of Health had said he had the matter before him. Alderman Adams was of the opinion that if sufficient pressure was brought to bear on the Government something might be done.

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THE FARADAY SOCIETY CONFERENCE

"DISPERSE SYSTEMS IN GASES, DUST, SMOKE AND FOG"

One of the most important conferences on problems related to atmospheric pollution was organized by the Faraday Society and held in Leeds in April of this year. The papers—thirty-three in number—were mainly highly technical in character and covered a wide field of scientific research, and were contributed by eminent workers from many countries. It is impossible in a brief account to review the symposium at length, and in these pages attention must be limited to a brief mention of those of particular interest to members of this Society. The papers will be found in full in the Transactions of the Faraday Society.

For the study of the physical nature and behaviour of smokes the first papers, including "Disperse Systems in Gases" by Professor R. Whytlaw-Gray, "The Determination of Size Distribution in Smokes" by H. S. Patterson and W. Cawood, and "Measurement of Optical Densities of Smoke Stains on Filter Papers" by A. S. G. Hill, may be referred to. Other interesting papers in this section are on "The Aggregation of Suspended Particles in Gases by Sonic and Supersonic Waves" by O. Brandt and E. Hiedemann, and related papers by Dr. E. N. Anrade and R. C. Parker. For the non-technical reader this subject may be described as experimental work on coagulating and precipitating smoke particles by means of sound waves and waves of lower frequencies.

The next section of the conference consisted of papers on aqueous and other volatile particles, i.e., mist, cloud, hygroscopic nuclei, town and country fogs ; the first paper being on "Meteorological Aspects" by G. M. B. Dobson. Of close interest to the smoke abatement problem is J. H. Coste's paper on "The Nature of Dispersoids in Country and Town Air," which, summarized states that dispersoids found in the air are partly natural to it. These have water for their main constituent. Others which are natural in origin but are associated with air that has travelled over land, are living cells. The air of towns, or which has travelled over towns, contains droplets formed from the gaseous products of combustion, and tar, soot, and ash from the combustion of fuel. Fine silicious matter may be found in the air of town or country. The concentrations of these dispersoids, even in highly polluted air, are very low.

An excellent summary of the tragic fog in the Meuse Valley in December, 1930, was contributed by Professor J. Firket of Liege University, mention of which has been made on previous occasions in the *Journal*.

The Mechanism of Combustion.

A paper of direct practical importance was contributed by Dr. R. Lessing, on "The Industrial Aspects of Disperse Systems in Air and Gases." The mechanism of the combustion of coal, and the reasons for the formation of smoke, is usefully expressed as follows :

"The mechanism of combustion in a fuel bed is complicated by the fact that combination with the oxygen in the air can only take place on the surface of a piece of coal. The rise in temperature causes layers below the surface to be subjected to thermal decomposition (carbonization) by which combustible gas and tar are liberated. Under the aerodynamic conditions controlling the burning mechanism, some of this volatile matter escapes so rapidly from the high temperature zone that its combustion is not completed. Unless it is subjected to contact with hot surfaces such as a furnace arch, and possibly to the action of secondary air, a portion will escape in form of tar suspended in the flue gases. Some may be heated high enough to suffer secondary thermal decomposition, but only after a time lag long enough to permit its escape from the combustion zone. In this case "soot" is formed. Firing conditions permitting the escape of tar vapour or soot do not obtain in modern, well-conducted furnace operations They are, however, the concomitant of the customary management—or lack of it—of the open fire in the domestic hearth. The tar content of deposits from the atmosphere can therefore be traced back with certainty to this source and its amount forms a measure of the chimney emission from domestic fireplaces in which raw coal is used."

The paper concludes with a survey of the methods of cleaning gases, and mentions the important differences in the methods employed at Battersea and at Fulham for the removal of sulphur dioxide from the flue gases. At Battersea a spray system is employed common to all the boilers, the washing water is allowed to become acid in the first stage during which iron is added for the catalytic oxidation of SO_2 to SO_3, and the effluent after neutralization with chalk and clarification is discharged into the Thames. At Fulham an individual washer of the grid type is provided for each boiler. A lime or chalk suspension is continuously circulated in film form from over the grids and only a small purge corresponding to the sulphur and dust extracted is withdrawn, clarified, and returned into the cycle. The mud containing calcium sulphate, calcium sulphite, and dust is discarded, but no effluent is sent into the river.

The Condition of the Atmosphere.

A paper by another member of the National Smoke Abatement Society is "Twenty-five Years' Progress in Smoke Abatement," by Dr. J. S. Owens. In this Dr. Owens reviews the progress which has been made, or not made, in towns for which pollution measurement records are available. The results of the examination show that a definite improvement has been indicated in

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A second group showing equally definite deterioration, consists of: Leeds (Headingley, Hunslet, Park Square, and York Road), Liverpool (Netherfield Road), Marple, St. Helens, and Stoke-on-Trent (Leek Road). A third group showing little or no change includes Castleford, Garston and Edinburgh.

Dr. Owens concludes his paper by saying " The fact that certain cities have reduced the pollution of their air very much is proof that it can be done with care and attention and might be given as an answer to any doubts raised by other cities as to their ability to reduce smoke. The condition in this country at present is by no means satisfactory and it is obvious that we should put a great deal more energy and effort into smoke prevention than we are doing. This might be taken as the lesson to be learnt from groups two and three. It is however not the cities only which suffer from the smoke pollution: it is astonishing the degree of pollution of the air in the open country to leeward of a great city such as London. The track of the smoke cloud is so great even in the open country under such conditions that far more attention should be given to it by Public Health authorities."

The Spread of Smoke.

A theoretical paper on " The Spread of Smoke and Gases from Chimneys " by C. H. Bosanquet and Dr. J. L. Pearson is summarized as follows: A theory has been developed by dimensional analysis for calculating the spreading of a smoke cloud from a chimney, and the results have been shown to agree reasonably well with experiment. At points close to the chimney the concentration at ground level is small since but little smoke has diffused down to the ground. At a distance of the order of ten times the height of the chimney the smoke concentration at ground level reaches a maximum. The concentration at that maximum varies inversely as the square of the chimney height, and its actual volume is almost independent of assumptions as to the variation of diffusion coefficient with height. At greater distances the concetration at ground level falls off again until after about fifty chimney heights the concentration varies as the inverse square of the distance and is independent of chimney height.

The Dissipation of Fog.

In a paper on this subject Professor D. Brunt discusses the methods which have been proposed, and considers at lenght the two which appear to have practical possibilities. The first is a thermal method, which consists in warming an area of fog until the fog-droplets are evaporated. To clear a large area, such as a town, would be prohibitively expensive or technically impossible, but the author estimates that using gas as the heating medium a space sufficient to permit the safe landing of an aeroplane could be cleared, and kept clear for ten minutes, at a cost of £35. Practical tests on this have been successfully carried out in the U.S.A.

Another method consists essentially in the removal of sufficient water vapour, by means of a hygroscopic spray from the air which carries the fog droplets, to ensure the subsequent evaporation of the droplets. A saturated solution of calcium chloride has been used for this purpose. Both this and the thermal method depend upon the fog possessing a movement due to slight wind, so that the operation can be carried out along a line of the necessary length to the windward side of the space to be cleared. The movement of the air would then create a clear space beyond this line.

The final paper of the symposium was entitled " A Commercial Plant for Removal of Smoke and Oxides of Sulphur from Flue Gases," and was presented by G. Nonhebel. This was an account of the Howden-I.C.I. grid-packed washer, units of which were put into operation at the Swansea Power Station last year, and which will also be used in the new Fulham Station. The paper by Pearson, Nonhebel, and Ulander, published in the Journals of the Institute of Fuel (1935,8,119) and of the Institution of Electrical Engineers (1935,77,1) on this plant and process has previously been mentioned in these pages. It may be noted that the elimination of SO_2 and SO_3 measured as total sulphur at the Swansea Station is no less than 99.7 per cent.

Visitors' Day at the Fuel Research Station.

By courtesy of the Director, a number of invitations to attend the Visitor's Day at the Fuel Research Station at East Greenwich on 9th June were issued to members of the Society. The whole of the station was thown open for inspection, and information concerning any item of plant or apparatus was instantly obtainanle by reference to the appropriate number in a comprehensive and detailed programme. Of particular interest were the domestic fuel testing rooms, in which the burning qualities of solid fuels are tested in open domestic grates. Measurements of heat required for ignition, the radiation during the life of the fire, and the amount of smoke produced, etc., are made, and methods of smoke reduction and of burning different fuels, such as high-temperature coke and coal slack, are investigated.

The pulverized fuel section and the hydrogenation building were also of special interest, as was the coal-purification building, in which were shown the various methods of wet cleaning and dry cleaning.

WHO'S WHO AT THE CONFERENCE

The Conference this year, in keeping with its circumstances, will be longer and of greater importance than usual. The list of speakers is almost formidable in its strength.

Among the Chairmen our President and Dr. R. Lessing need no introduction. Sir Francis Fremantle is an elected member of the Council, and in addition to being a medical man is a Member of Parliament closely connected with many aspects of public health work. Sir Richard Gregory is Editor of "Nature," and Sir George Newman was, until his recent retirement, Chief Medical Officer of the Ministry of Health. Professor Sir John Robertson, of the University of Birmingham, was at one time Medical Officer of that City, and is the author of a number of important works on public health and housing questions.

The first speakers at the conference are Mr. A. T. Barber and Mr. T. F. Hurley of the Fuel Research Station, and both have considerable first-hand knowledge of the subject on which they are to speak. Mr. H. C. Armstrong, a member of the Council of the Institute of Fuel, is Fuel Officer of Messrs. John Brown and Thomas Firth, one of the leading firms in the steel industry. The considerable and difficult problem of potteries smoke will be dealt with in a paper by Mr. E. Rowden and Mr. A. T. Green, of the British Refractories Research Association.

Dr. Margaret Fishenden's name is too familiar to all connected with smoke abatement to need description. Mr. Noel Carrington, a member of the Council of the Design and Industries Association, is to speak on aspects of the problem not always sufficiently considered. He wrote a splendidly forceful article on the smoke problem in the "News-Chronicle" some months ago.

Sir Arthur Hill, who is Director of the Royal Botanic Gardens, Kew, has closely studied the effects of atmospheric pollutants upon vegetation, and the Conference will be fortunate in hearing his exposition of this serious aspect of the question.

The name of Dr. J. S. Owens comes too frequently in the literature of smoke abatement and atmospheric pollution to need further comment, and his paper should be particularly of direct importance to all who are concerned with the measurement of pollution.

The speakers in the "Smoke, Light and Health" session on the Friday morning will make this perhaps the most important part of the conference. Sir Leonard Hill's work on light and physiology is known to all, and Sir Henry Gauvain, of Alton, and Sir Pendrill Varrier-Jones, of Papworth, are more qualified than any other persons to speak on the effects that a polluted atmosphere and the obstruction of light have upon the problem of tuberculosis.

The final session, of importance to all municipal representatives, will consist of papers by Dr. A. S. M. Macgregor, Medical Officer of Health for Glasgow, who has intimate knowledge of the part the atmosphere plays in the health of a great city; and Mr. H. G. Clinch, one of the best-known Sanitary and Smoke Inspectors, and author of the valuable text-book, "The Smoke Inspector's Handbook."

NEWS AND VIEWS

Regional Committee for South Staffordshire?

Dr. J. L. Gregory, Medical Officer for Willenhall U.D.C. in his Annual Report for 1935 states, in referring to the smoke nuisance:

"Although in recent times we have made great advances in securing pure water and pure food the same progress has not been made with regard to the air we breathe. An important point is that it is not only the factory chimney that pollutes the atmosphere but also the domestic one. Smoke is regarded as a predisposing factor in the cause of fog after which bronchitis, pneumonia and other lung complaints are common.

"Provision is made for a combination of local authorities to carry out duties in regard to smoke abatement, and the southern part of Staffordshire would appear to be a suitable area for such a joint committee and more might be done as regards getting into touch with manufacturers and carrying out general propaganda work."

Action after 45 Years.

A case against an Oldham firm for an alleged smoke nuisance recently failed on the grounds that legal requirements had not been complied with by the prosecution, the Oldham Corporation. A notice was served upon the firm in August, 1891, calling upon them to discontinue the emission of black smoke. The case was that the offence had been repeated in June this year, which under the Act rendered the offender liable to a penalty, due notice having been sent and the offence repeated.

For the defence it was stated that it must be proved that in 1891 prior to the notice there was an emission of black smoke, and also that a notice had been served. Neither had been proved.

The justices, after retirement, said they believed the case had not been proved under the Act, and it would be dismissed.

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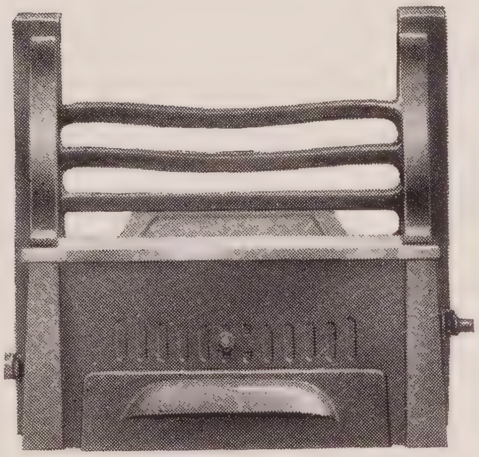

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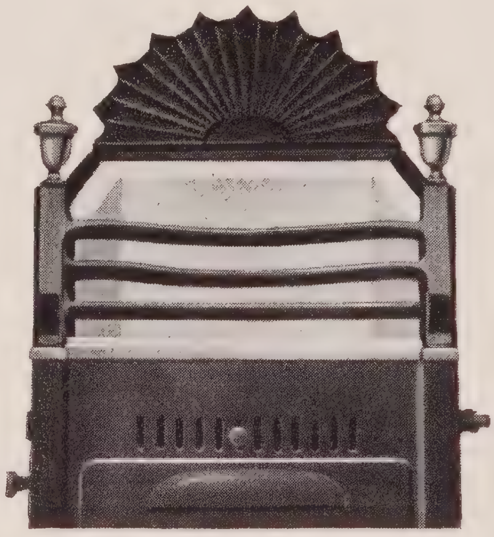

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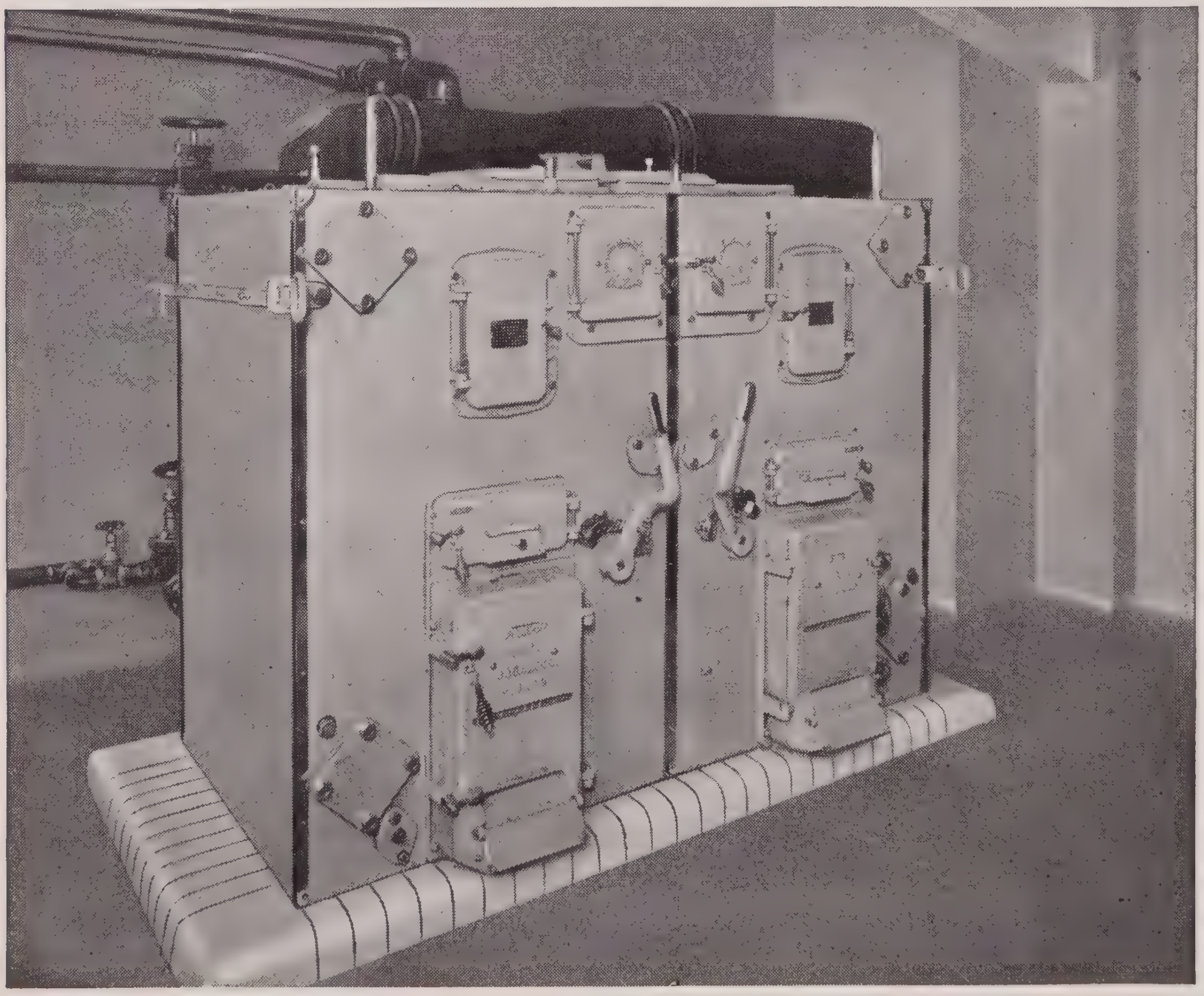

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The Science Museum Exhibition.

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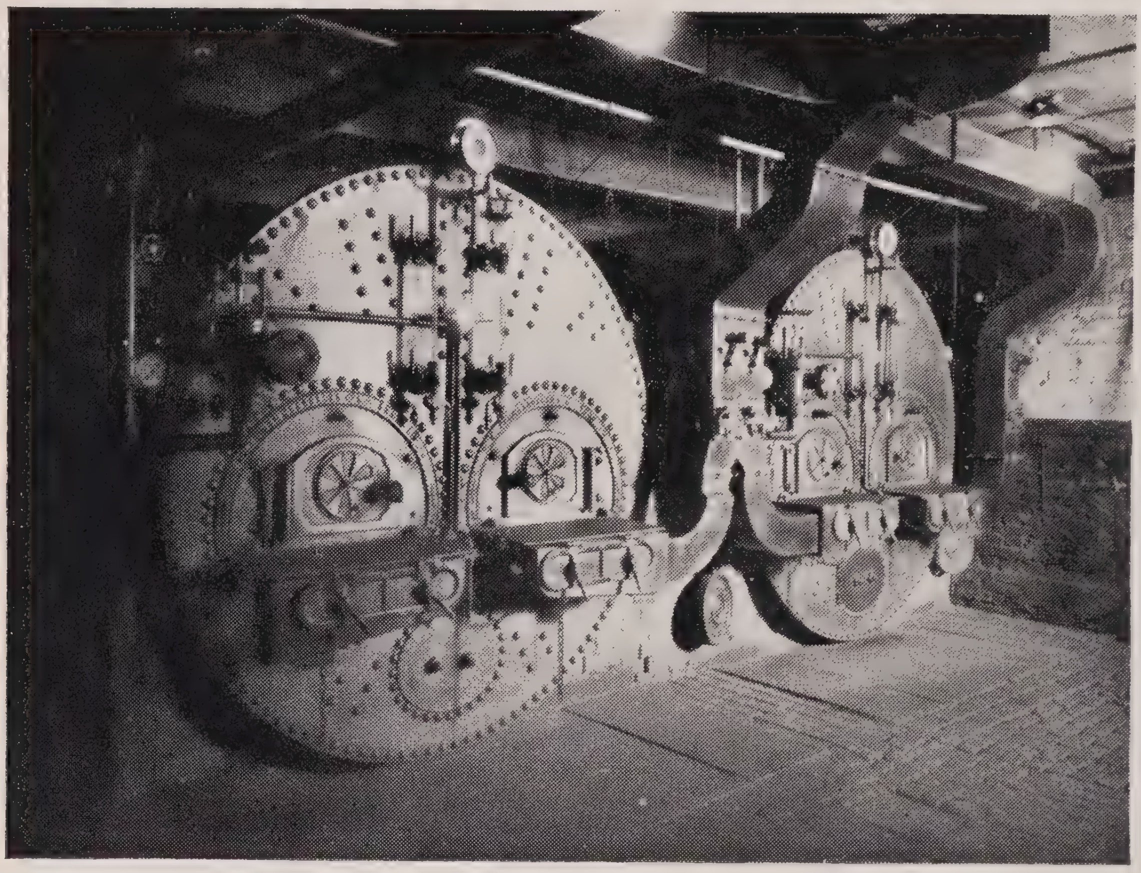

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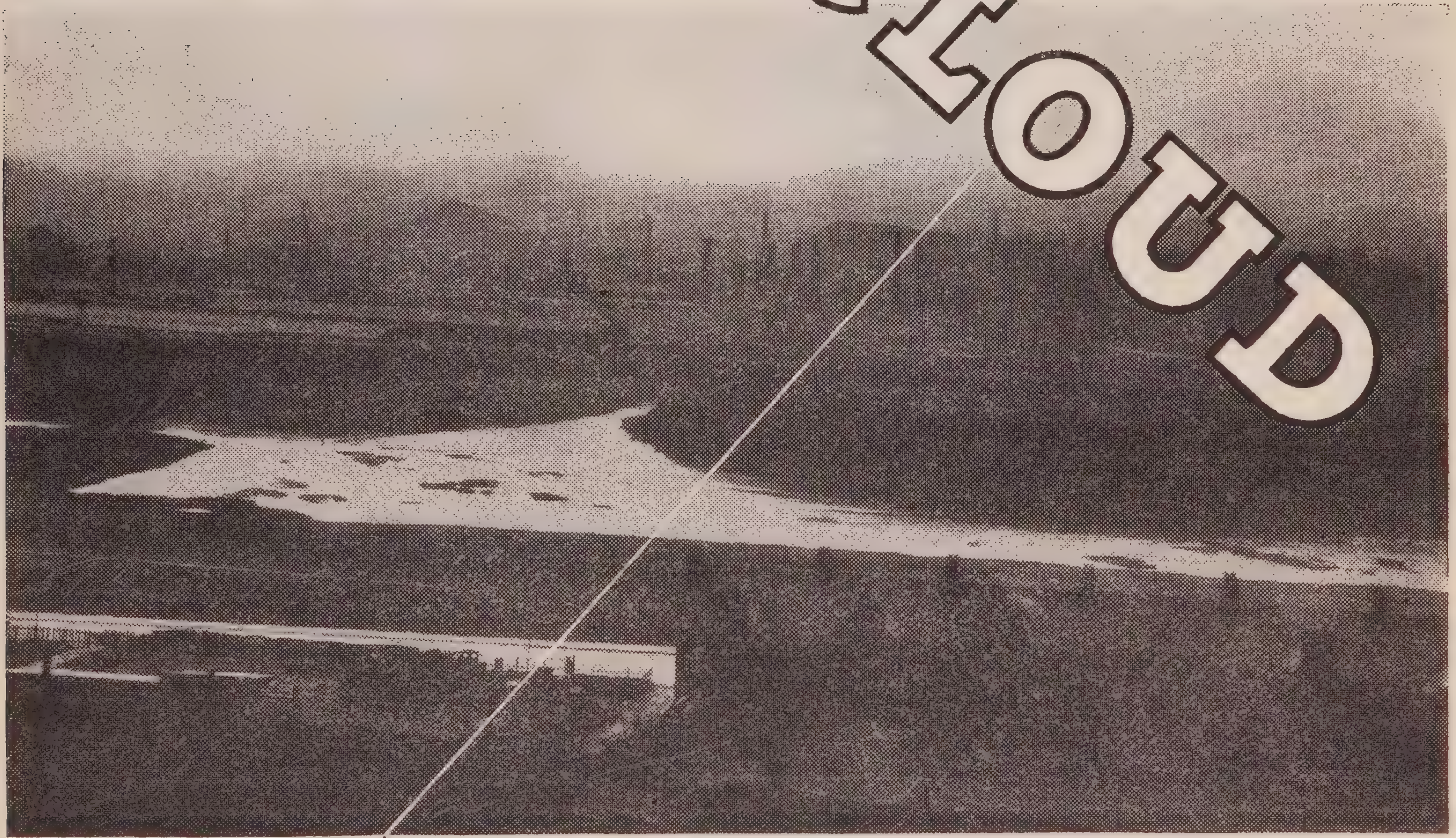

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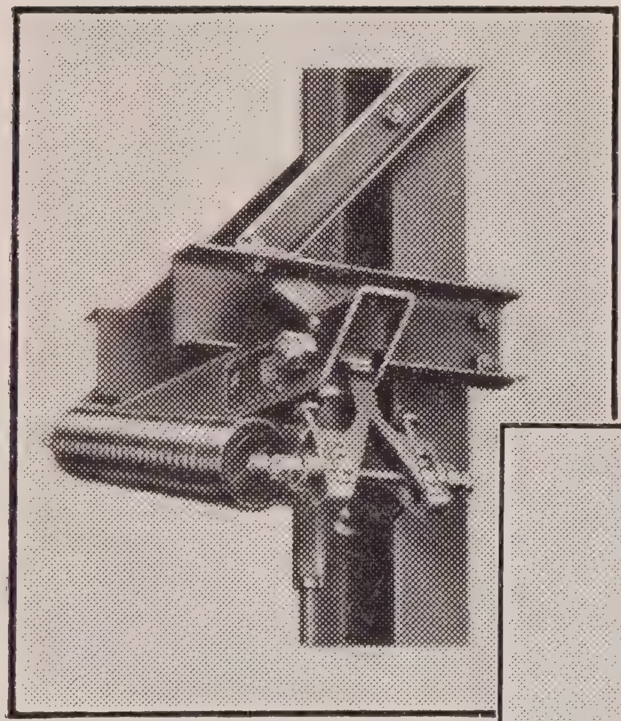

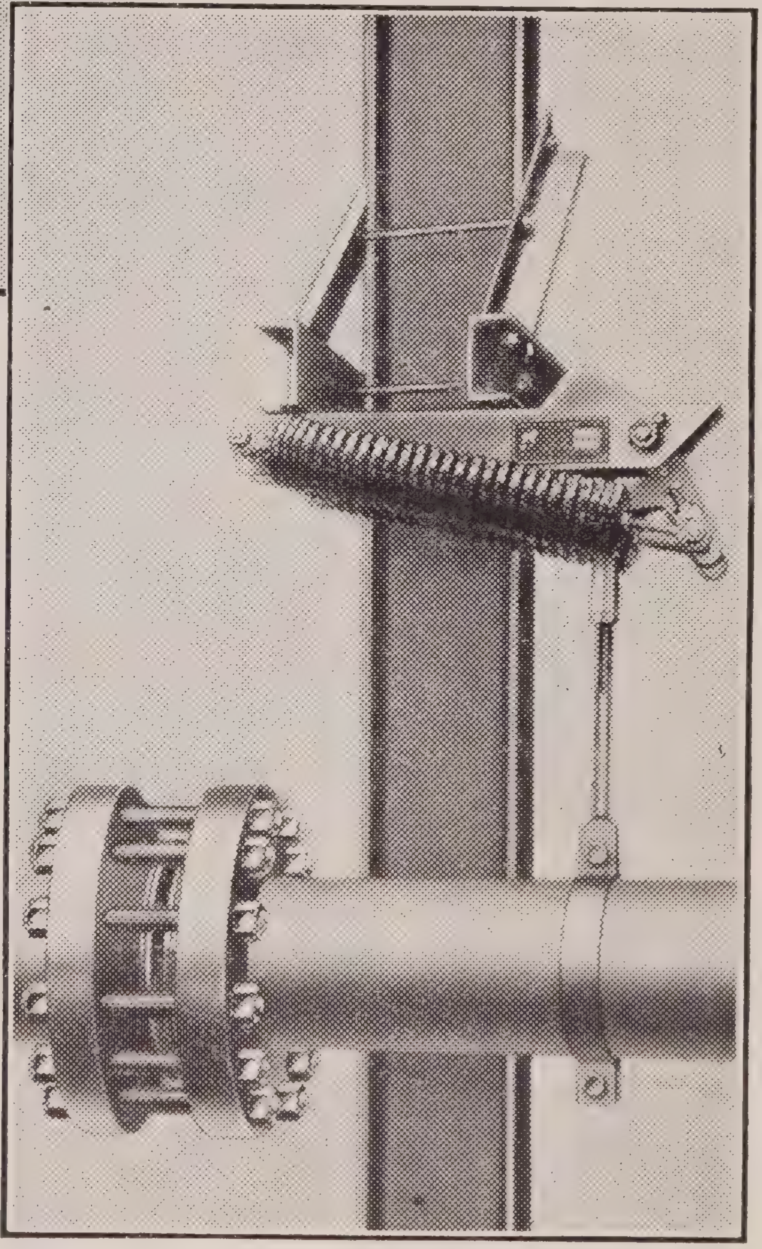

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The Journal of the
National Smoke Abatement Society

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The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.

COMMENTARY

THE late appearance of this issue of the *Journal* is only one, and that a minor, consequence of the recent memorable events at the Science Museum. October, 1936, will be an important milestone in the history of the smoke abatement movement, and, very probably, its importance will be recognized more clearly in the future than is at present possible. The Exhibition was more successful than we had dared to hope; the Conference, in papers, discussions, and attendance, reached new standards; and the widespread stimulation of interest in the subject from members of the Government to schoolboys at the Museum, was most gratifying. Elsewhere in this issue mention is made of some of the events but the Exhibition itself is completely described in the special Handbook and Catalogue, and the Conference will be fully reported in the *Proceedings*—which will be published as quickly as our small office organization can deal with it.

At the time of writing the office is doing all it can to cope with what committee agenda call "matters arising." Most of these do not end with the closing of the old books, but rather with the opening of new ones. The Science Museum has not been an effort made with the object of allowing the movement to sit down and admire what it has done, but must on the other hand be considered as a step forward that will enable us to do more than was previously possible. The real success of our recent work will be measured by the extent to which we can forget it: the extent to which it will be overshadowed by new activity it has helped to make possible. There is every prospect of new activity in abundance, but, as

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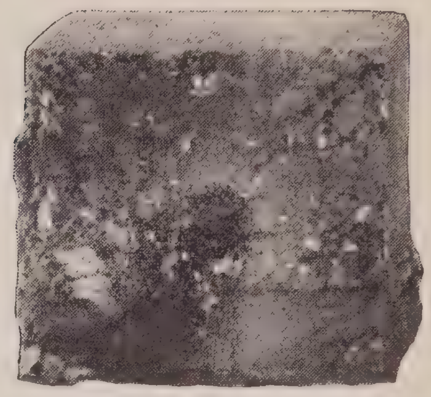

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always, this is necessarily proportional to the extent to which our members and friends support us.

Immediate tasks are to set up the joint committee of representatives of the Society and other interested organizations to consider regulations for ensuring smokelessness in buildings and plant equipped by public money and to investigate the important proposals for "smokeless zones." This, it will be recalled, was the gist of the Executive's resolution passed at the Annual General Meeting, and was also the principal subject in a paper read by three members of the Society to a meeting of the R.I.B.A. held later at the Science Museum. This paper will be considered more fully in the next issue. The other resolution, about which it is hoped to make early representations, concerns the prevention or abatement of nuisances from burning pit heaps or colliery spoil banks—an important problem in many mining districts. Then, also, there was the informal but none the less definite resolution proposed by Dr. Johnstone Jervis, calling on the Society to do what was possible to bring about a reduction of smoke from railways in city stations and urban areas. Apart from the conference, a valuable decision, foreshadowing further exhibition work, was that made by the Technical Advisory Committee (a committee of representatives which had dealt with the practical side of arranging the Exhibition) at a meeting held towards the end of the month. It was unanimously agreed that the Exhibition had been a marked success and that its character was such that it was of real value, and therefore it was desirable to keep the Committee in existence to enable the constituent parts to be brought together without difficulty whenever there was the opportunity of similar exhibitions in the future.

One of the most interesting features of the last few months has been the welcome recognition of the need for smoke abatement, and the reality of a smoke nuisance, by the coal industry. The Coal Utilisation Council and the Coal Burning Appliance Makers' Association co-operated with us in preparing the Exhibition and were responsible for the interesting section devoted to steam-raising by solid fuel. The interest of the C.U.C. was further shown by their appointment of eighteen representatives to the Conference and by their publication of a practical pamphlet on smoke abatement, which is a marked advance on any previous statement sponsored by the coal industry.

The Society's own stock of exhibits is richer as a result of the Exhibition; a number of interesting items having been presented to us by those who loaned them for use at the Science Museum. Of these the most fascinating is a photostat copy of the smoke abatement decree made by Edward I. This was kindly presented to us by the Record Office, and, when space permits, the wording of the decree will be published in the *Journal*. We also hope to publish extracts from a pamphlet of historical interest—*Campania Foelix*—which was shown to us during the preparation of the Exhibition by the Librarian of the London Guildhall, and of which a photostat copy has been made and is now in the Society's library. Although it is not so engrossing as Evelyn's *Fumifugium*, it is a striking indictment of London in 1700, and pleads for a return to wood fuel. Extensive afforestation is proposed and a detailed scheme is propounded. It may be speculated whether wood could not be more extensively used even to-day. The slight smoke is innocuous and those who sentimentally demand flames and crackling could have them to their heart's content. The birth-control of books that Lord Horder suggests, would, one imagines, release ample supplies of fuel. The statistically-minded might also care to estimate how many wood fires would be possible if some benevolent dictator were to suppress Sunday newspapers.

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THE EXHIBITION AND CONFERENCE

SIR KINGSLEY WOOD'S SPEECH

The Exhibition was formally opened by the Minister of Health, Sir Kingsley Wood, on 1st October, at a ceremony in the Lecture Theatre of the Museum. Dr. Des Voeux presided, and a vote of thanks to the Minister was moved by Mr. Charles Gandy and seconded by Colonel Mackinstosh, Director of the Museum. Also on the dais was Sir Henry Lyons, Chairman of the Museum's Advisory Council.

Sir Kingsley Wood said that smoke lowered our vitality and it cost the country many millions a year. Despite the fact that there were many more houses and factories requiring heat and power, conditions were better to-day, and there was a considerable increase in the consumption of gas and electricity and smokeless fuel. But there was little reason for complacency, legislation was not the most important factor in smoke abatement to-day but prudent and efficient administration and co-operation between public authorities, industrialists, and voluntary organizations in order to secure a better condition of things in this country.

Sunshine and Life.

" Smoke," continued Sir Kingsley, " is a real and insidious enemy of good health. Sunshine and fresh air give life and vigour ; smoke lowers our vitality, weakens our power of resistance to disease and damages our homes. A polluted atmosphere is decidedly economically wasteful. Nobody today subscribes to the sentiments expressed by Josiah Bounderby of Dicken's ' Hard Times ' concerning the smoke of Coketown : ' First of all you see our smoke—that's meat and drink to us—It's the healthiest thing in the world in all respects and particularly for the lungs.' Josiah Bounderby badly needed an elementary health course."

Better Conditions To-day.

" The smoke nuisance is an old trouble. In Elizabeth's reign proclamations were issued forbidding the use of coal in London when Parliament was sitting' which shows that they appreciated in those days the value of a healthy House of Commons, whatever might be the lot of the rest of the country. But, black as smoke's record is, conditions are better to-day despite the fact that there are many more houses and factories requiring heat and power. There has been an increase in dwelling-houses alone of something like 4¼ millions since 1901. In the three million houses that have been erected since the war provision has been freely made for the installation of methods of heating and cooking which will reduce smoke, and the use of gas, electricity, and smokeless fuels in place of crude coal is steadily growing among householders generally. There has been a marked decline in the mortality from bronchitis, which is no doubt influenced in a particular degree by pollution of the atmosphere. It cannot be doubted that every reduction in the extent of atmospheric pollution has made, and will make, a contribution to the health of the Nation."

Sir Kingsley Wood concluded by saying that an encouraging feature of the situation was the readiness with which many manufacturers were willing to join with other interests in taking steps to improve matters. Regional smoke abatement committees were also doing good work, and their work should be extended. Domestic smoke now constituted the largest part of the smoke problem and administrative measures must be backed up by steps to apprise the public still further not only of the advantages of smoke abatement, but also of the way in which smoke abatement may be secured in the individuals' private house.

It was still true to say, as Evelyn said 250 years ago, " That men whose very being is Aer, should not breathe it freely when they may but condemn themselves to this misery, is strange stupidity."

CONFERENCE RESOLUTIONS

The first resolution adopted at the Annual General Meeting, held on 17th October, 1936 at the Science Museum, South Kensington, was as follows :

" This meeting of the National Smoke Abatement Society, considering smoke a public nuisance, and being of the opinion that it is now practicable to secure the installation of plant and appliances for the smokeless combustion of fuels, whether for manufacturing processes, steam-raising, heating or cooking, in all new buildings (excluding for the purpose of this resolution, dwellinghouses) and in existing buildings where new plant and appliances are being installed, resolves :

(*a*) That it is desirable that regulations should be drawn up to ensure that where public money, whether derived from national or local rates, is expended upon, or is used for purposes which include the purchase of, plant and appliances for the combustion of fuels, such plant or appliances should be smokeless in operation ;

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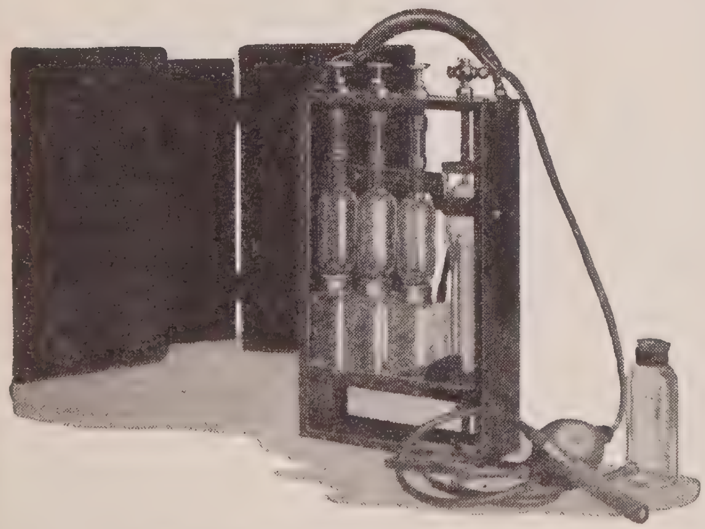

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(*b*) That the Executive Committee be asked to seek the co-operation of other organizations likely to be interested in this question with a view to the formation of a joint committee to draft suggested regulations for this purpose, examine the methods by which they can be applied, and make appropriate representations to government departments, local authorities and other bodies expending or advancing public money ; and

(*c*) That government departments, local authorities and other bodies expending or advancing public money should in the meantime be urged to take all available steps to ensure that in buildings under their control all plant and appliances shall be operated smokelessly.

It is also resolved that the joint committee envisaged in (*b*) above be requested to consider the practicability and desirability of regulations for the prohibition of smoke emission in specified central areas or zones of the principal cities."

The second resolution, proposed on behalf of the Northumberland and Durham Advisory Regional Smoke Abatement Committee, and unanimously carried, read as follows :

" That this meeting of the National Smoke Abatement Society begs to draw the attention of the Minister of Health and of members of Parliament for the areas affected to the serious nuisance caused by burning pit heaps or colliery spoil banks ; and, being of the opinion that, as for example instanced in the last published report on Alkali, Etc. Works, measures for both the abatement and the prevention of such nuisances are practicable, expresses the desirability of legislation which will (*a*) permit the abatement of existing nuisances and (*b*) enable new pit heaps to be so controlled that such nuisances will not arise."

THE PRESENTATION TO THE PRESIDENT

The presentation to Dr. H. A. Des Voeux was made at a dinner at the Hotel Rembrandt at the close of the Conference. The function was of a pleasing and enjoyable nature, and both Alderman Melland, who presided, and Dr. Des Voeux excelled themselves in the felicity of their speeches. The gift, subscribed to by many members of the Society and old friends of the movement, took the form of a clock in green onyx and an illuminated address in book form containing the names of those who joined in the presentation. By happy thought a gift of a travelling dressing set was made to Mrs. Des Voeux.

The wording of the Address will be of interest to all who helped to make it possible, and is as follows :

" Thirty-seven years ago you, with others of like mind, took up arms against the dirt and fogs of London. In your own home the Coal Smoke Abatement Society held its first meetings, and with commendable foresight elected you as its Honorary Treasurer.

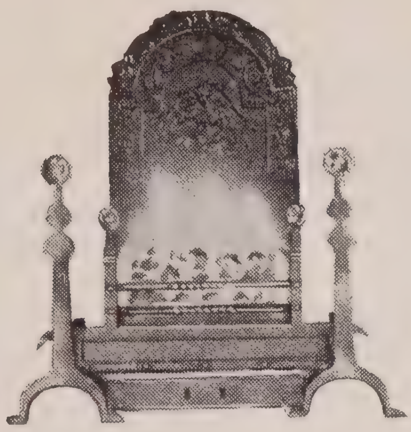
" In those early days you were all woefully misunderstood and were looked upon as unworldly, unpractical idealists, for having the courage to declare that coal smoke was not only an evil but was an unnecessary evil. But you persevered through long years of slow progress, gradually achieving the first necessary step : the recognition of smoke abatement as a serious question that had to be taken seriously.

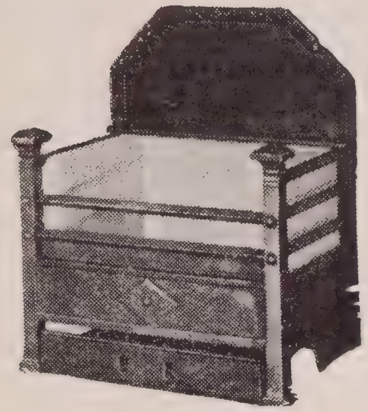
" You were largely responsible for the first measurements of atmospheric pollution, the results of which no one would at first publish. That investigation, too was continued and to-day more than ample justification of those early efforts is seen in the blue-backed reports that are issued each year by the Department of State that now controls the investigation.

" When, in 1929, your Society joined forces with its ally from the North, it was fit and proper that you should be elected as the President of the new, the National, Smoke Abatement Society. It was fit and proper too, that you should respond, on behalf of the Society, to the first Civic welcome to be given to our meetings.

" It is because of all you have done for our movement, all the time and labour and devotion that you have given to it, that we, the undersigned, have joined together to present to you a slight material token of our regard and deep appreciation. We feel that our Exhibition at the Science Museum is an event of sufficient importance in the history of the Society to make it appropriate for us to express our thanks to you, who, more than any other, has made such an occasion possible, and to hope that during many more years of increasing progress you will be able to lead and guide the cause you have so much at heart."

Then follow the names of all who contributed to the presentation. The address is inscribed on vellum, illuminated and with the Society's Evelyn emblem at the head of the first page. It is bound in limp blue morocco, with Dr. Des Voeux's monogram in gilt.





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The Fourth in the Series of Regional Reviews

SMOKE ABATEMENT IN THE WEST RIDING

By ERNEST CLEGG, A.M.I.Mech.E.

(Smoke Inspector, Bradford)

I am a Chartered Mechanical Engineer, and also an Associate Member of the Royal Sanitary Institute, and during the course of my remarks I shall endeavour to observe the position that—Both parties being my friends—it is a sacred duty to honour truth first :—

Yorkshire, the county of broad acres is divided into three shires. The largest of these occupies the greater part of the Western half of the county and is known as the West Riding. The scenery in many parts is picturesque and romantic, the air pure and health giving ; but the hands of men and the misuse of raw coal, have converted a region of this fair land to a grimy ugliness not exceeded elsewhere.

About the middle of the shire, there lies a dense industrial area which forms a rough circle twenty to twenty-five miles in diameter, embracing the towns of Leeds, Bradford, Huddersfield, Wakefield, Halifax, Dewsbury, Keighley, Batley, Morley, Brighouse, Barnsley, etc. Some of these towns are quite hilly with ground contours like huge saucers, and when viewed from the outer rim, a grim sight often meets the eye—a whole town obliterated, and its toiling inhabitants, buried beneath an ever-spreading canopy of opaque smoke.

The records of one town show that its first Smoke Nuisance Committee was formed in 1814—to inspect and consider the chimneys of a brewery, a foundry, and a spinning mill.

Industries of the District.

The chief industry is the textile trade—both cotton and woollen, the latter predominating. The wool is largely imported in its raw state and washed, combed, spun, dyed and woven into beautiful fabrics and cloths. Coal mining and engineering probably come next in importance. A variety of other trades are also carried on in the district.

In one or two towns, the residential and industrial areas are fairly well separated ; but in many districts, the houses and factories are placed in close proximity to each other. On some roads the mills and factories face one another for miles, whilst the homes of the work people are set up in the side streets. Most of the factories were founded and operated by Yorkshiremen, of hardy stock, dogged grit, and independence. These are the type of men who operate the works to-day ; stubborn men who do not easily bow to authority or fine phrases.

Industrial Pollution.

No reliable details of the boiler plants in the whole district are available. However, some official figures for Bradford, a town with a population of nearly 300,000, taken during a time of normal employment, may be of interest. These show that 1,296,000 tons of coal are consumed per annum for industrial purposes, and 340,000 for domestic use. The industrial smoke is discharged from a forest of 524 chimneys, of various heights up to 245 feet. Altogether, 646 men are directly employed in attending to 716 steam boilers, which include 439 huge Lancashire boilers ; 359 or 69% being equipped with mechanical stokers. It will be seen that the industrial coal consumption is nearly four times greater than that used for domestic purposes. The proportion over the whole area is slightly less, probably about 3 to 1.

General Industrial Smoke.

Steam boiler smoke is the chief trouble in the district. Many miscellaneous trades are carried on that are to be found elsewhere, and produce no more and no less smoke than is to be found in other places. There are a small number of chimneys working to exempted iron and steel and other metal processes, that sometimes produce very bad smoke ; but, on the whole, engineering works chimneys are fairly good.

Colliery chimneys are sometimes very bad offenders and frequently discharge long streams of black smoke that can be seen for miles. Undue forcing of fires, gross negligence and indifference are common faults ; the average colliery boiler firer gives little attention to smoke emissions. Fortunately many of the pits are well away from the larger towns, but nevertheless they add considerably to the general pollution. An impression undoubtedly exists in many quarters that these chimneys are exempted from the Smoke Acts.

Fluctuating Loads.

In many sections of the textile trade, the quantity of steam used for motive power purposes is comparatively small as compared with the amount used for process work. In the dyeing industry about 80% of the steam produced is used in the process of dyeing material. In the wool-combing about 65% of the steam is required for process work. The steam demand varies considerably at these works, and excuses for smoke making are frequently blamed to that account.

At many of the larger works it is found that as one process works out, another commences, and the call for steam requires no excessive changes. If the fluctuation is very great, it is the practice to retain an extra boiler under full steam pressure, with banked fires ; this acts as an accumulator which can be immediately put into

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use as required. Unfortunately a few plants are only large enough for average requirements and at times of peak load, excessive firing and raking of fires takes place, with consequent smoke formation. On the other hand a few boilers produce smoke at seasonal and other periods of light loading, due to working with over-long furnaces, involving thin fires and low temperatures.

These changing loads must be borne in mind when designing and installing new boiler plant ; with both old and new plant, a greater degree of thought, skill and care, is required to ensure smokeless operation, as compared with a steady loaded boiler plant.

Smoke Other than Black.

An appreciable number of chimneys never cease discharging grey smoke during working hours. Such smoke is invariably made where certain types of mechanical stokers are installed, along with modern devices to enable steam to be produced at lowest possible cost.

From an engineering point of view, an excess of air may constitute a much greater loss than that due to smoke ; and in practice, attenpts are made to reduce the excess air losses, by deliberately cutting down the draught to the barest possible margin. So long as the furnaces operate in a condition of air starvation, smoke is formed, and the greater the air restriction, the denser the smoke emission.

It is the opinion of many close observers that these non-stop emissions, create a greater total pollution than the intermittent emissions of black smoke.

Electric Power Stations.

Electric power station emissions have recently caused grave concern. The coal consumption at two stations in the district is nearly 300,000 tons per annum. At one works where pulverized fuel is burned, fine, white, fly-ash, is rained down over a considerable area. A scheme to increase the efficiency of the grit arresting apparatus is under consideration. The ten steel chimneys of the other station, which formerly produced little smoke, are now continuously discharging a blue-white, sulphury smoke, which sometimes comes down to ground level ; at other times it forms a wide overhead river of dense blue haze. In this case it is proposed to erect one or two large chimneys several hundred feet high, to discharge the smoke where it will not come down to ground in visible form.

Grit and Soot.

The limit of human endurance is experienced in several smoke-ridden areas where cinder grits—like black sand, are rained down from some factory chimneys so thickly that in one day no half inch is uncovered—nothing escapes.

The cinder grits are often discharged from Lancashire boiler plant, where cheap, fine slack, is fired by mechanical sprinkling, forced draught stokers.

To pile on the agony ; a mixture of pure soot and fuel dust, is blown up some chimneys every night by means of a permanent installation of about thirty steam jet nozzles in the flues of each boiler. The steam jets are operated in series and all the soot and dust is blown in successive stages through the flues and economiser and up the chimney. Collecting chambers are sometimes fixed just in front of the chimney to receive the blown soot-dust, but tests made by the writer have proved them to be of low efficiency.

Present legislation is almost useless in dealing with grit offenders, if such chimneys are in a crowded factory chimney area ; largely owing to the difficulty in proving identification of the offending chimney.

One authority has already sought further powers to deal with the matter in a private bill, but unfortunately its passage through Parliament was blocked by a local member of Parliament.

West Riding of Yorkshire Regional Smoke Abatement Committee.

This Committee with its 86 constituent authorities was formed in 1925. About six meetings are held annually and the smoke situation affecting all the area is regularly reviewed. Invaluable pioneering work has been done in the promotion of special classes in Boiler House practice at about eight institutes or colleges in the area.

A carefully considered, not-too-technical syllabus meets the needs of the students in a practical way. The Committee has its own examination board, and both written and practical examinations are held—the latter in the boilerhouse. Certificates are only awarded to those who pass both examinations.

The examination board have found the practical test invaluable ; as certain men who could muster 90% marks in the written examination and could write a passable book on the subject, fail lamentably when tested in front of the boiler, and to risk the safe working of boilers in such hands might be fraught with danger.

The committee, recognizing the need for a national certificate, explored many avenues, and finally came to an understanding which resulted in the present City & Gulids of London examination, which does not supersede but is an addition to their own local examination.

To some steam users, the classes do not appeal ; others not only encourage the men to attend but pay the fees.

They are well rewarded, as the men take a greater interest in the boiler house, becoming more painstaking, conscientious and careful.

Careful investigation shows that more than 90% of black smoke offences are not due to insufficient plant or lack of knowledge, but simply to want of thought and care. The classes are therefore worthy of the greatest support, even if they do nothing but encourage a smoke conscience and the avoidance of negligence, two most vital factors in industrial smoke prevention.

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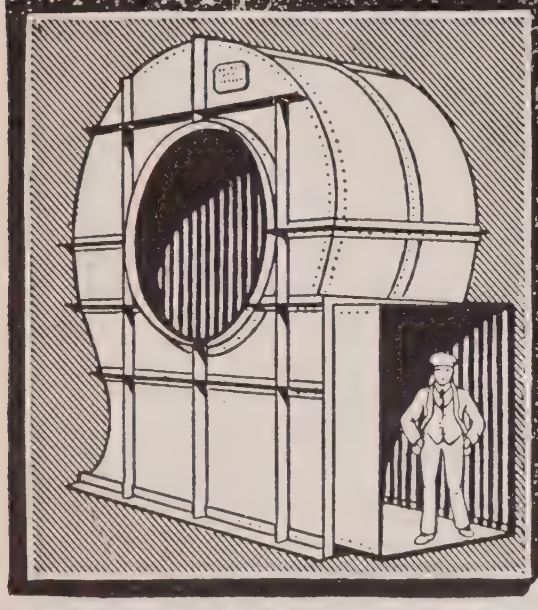

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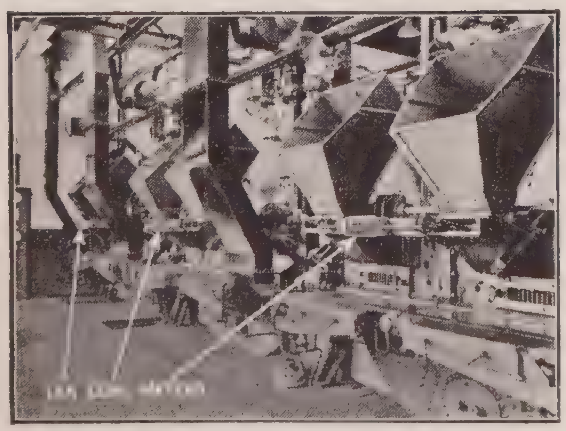

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Local Authorities—Various Methods.

Each authority adopts its own method of procedure for the attainment of smoke abatement. The measurement of air pollution is regarded with great importance in some districts ; whilst in others it is considered to be of little service in practical smoke prevention.

Great variation exists between different authorities in the number of observations upon each chimney in their area. In one year, 15 observations were made per chimney by one authority ; another authority made two observations.

A total of 7,105 observations were made in one area and less than 1% were found to be exceeding the 3 minutes limit ; in another, 46 observations showed 33% exceeding the limit. In some districts all observations are timed and occupy 30 minutes ; in others many observations are for shorter periods and untimed. It is the practice in one town to inspect the furnaces of all offenders and advise or warn accordingly ; in some areas very few furnaces are inspected. In another area, only letters of complaint are sent to offenders, and letters of excuses readily accepted. Yet in another town statutory notices are sent to every offender and the law is carried to its full conclusion.

The last mentioned authority find that an occasional heavy penalty for gross or habitual negligence, is a far greater deterrent than months of talk and "advice" further it has a subtle effect in clearing up many other chimneys, in the locality.

The whole story has not been told, but it is apparent some authorities make little use of the powers conferred upon them, and many offenders escape with impunity.

Here I venture to suggest that the greatest work which the Regional Smoke Abatement Committee can now undertake, is to become a statutory body, administer the smoke Acts without fear or favour, and place the spadework of smoke prevention, in the hands of forceful and competent specialist engineers.

Smoke and the Householder.

The enormous preponderance of factory smoke is felt throughout the district. The ordinary person has hazy ideas on the matter ; he thinks that it can be stopped and that it ought to be stopped, but unless it enters his house in almost visible form, he does not desire to complain to create a disturbance. The average Yorkshire householder believes that every man should stand by his own bat, and if every factory chimney discharged no more smoke than his did, Harrogate would have many rivals.

The facts are that many people who can afford have gone to live outside the intense factory areas, whilst many who have to stay, think that the factory owner ought to be made to live within the shadow of his own mill chimney.

The prospect with regard to domestic smoke is not too bright. In some districts, council houses of the parlour type have only one solid fuel burning fireplace ; prospective tenants frequently object to them on that account. Inquiries amongst the leading fuel merchants indicate that the increase in the use of smokeless fuel is very slow. However, it is some consolation to know that gas, and electricity are being used in increasing quantities.

REGIONAL COMMITTEE NEWS

Northumberland and Durham.

The Committee, through Alderman Adams, M.P., its chairman and a member of the Executive Committee of the Society's Executive Committee, proposed a resolution (given on another page) at the Society's Annual General Meeting, on the problem of smoke nuisances from burning pit heaps. This was agreed to after a discussion at which such a resoltuion was requested on behalf of the Bedlingtonshire U.D.C.

Efforts are to be made during the present winter session to establish an instruction course for firemen and boiler attendants. Last year the proposed course had to be abandoned because of an insufficiency of students and apparent lack of support by industrial firms.

West Riding of Yorkshire.

The Committee has now a membership of 86 local authorities. The Annual Report for 1935-36 has now been issued, and records that the Committee has now been in existence for a decade. Reviewing its achievement, the Report says : "Judging from the soot deposit records which for Leeds and Wakefield are available for the whole ten years and for other parts of the area for shorter periods, the progress made towards a cleaner atmosphere has not been very marked. With the exception of one or two areas, Wakefield and Bradford in particular, there has been practically no reduction in the sootfall. Actually in some cases there has been an increase though not of such moment as to cause alarm. Generally speaking, however, the records are disappointing."

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"FUEL ECONOMY AND SMOKE PREVENTION"; (Steam Raising, Oven Furnaces and the Art of successful Boiler Firing);

"CINEMA HEATING";

"SMOKELESS OPEN FIRES";

"DOMESTIC BOILERS";

"GLASSHOUSE HEATING" (How to save on your fuel costs).

"GRASS DRYING";

"SOIL WARMING" (Fruit Growers and Nurserymen).

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Further extracts from the Report are as follows: "In casting round for an explanation the first thing that occurs to one is that whereas the larger urban authorities have invariably been most active in the promotion of measures for smoke abatement, the same cannot be said of some of the smaller authorities where the opportunities for the introduction of smokeless methods both in the home and in industry are neither so many nor so easy of application. In other words the good authority suffers from the inactivity of its less progressive neighbour."

"The only way of dealing with the problem is by educating public opinion and trying to induce householders to adopt smokeless methods of heating and cooking. At the present time when local authorities are engaged in clearing away insanitary property and opening out new housing estates an attempt should be made to ensure that these estates shall be, if not smokeless, at least as free from smoke as possible. To this end the Committee addressed a circular letter to all the constituent authorities exhorting them to give this matter their earnest consideration and so to arrange their housing and re-housing programmes as to ensure that every house is provided with appliances capable of burning smokeless fuel.

"The development of a smoke conscience amongst the public remains as difficult as ever. The slavish adherence to tradition and the mistaken impression that a coal fire is essential to home comfort are holding up the advance towards a cleaner atmosphere. Had it been the water, milk, or food supplies that were contaminated the demand for reform by the public would have been immediate and insistent, but because it is the air the people are prepared to put up with conditions which from an aesthetic, economic or hygienic point of view are totally indefensible and a disgrace to our civilization."

West Lancashire and Cheshire.

The principal activity in connection with smoke abatement in the area of the Committee has been a well-organized and influentially-supported step to reduce smoke from the railways in the city of Liverpool. A meeting was convened by the Lord Mayor of Liverpool (Councillor R. J. Hall) on 3rd September, and was attended by local members of Parliament, members of the City Council, health and housing officials, and representatives of the University of Liverpool, the Chamber of Commerce, and other bodies. Letters of support were received from the Bishop of Liverpool, Archbishop Downey, Lord Derby and the Vice-Chancellor of the University.

When Lime Street Station became the railway terminous about 100 years ago, said the Lord Mayor, a covenant was entered into that there should be no excessive smoke. Those connected with the University knew how the covenant had been violated, and similar testimony would no doubt be forthcoming from residents in the vicinity and from the Director of Housing. The total number of trains arriving at and departing from the principal stations daily was 825, plus extra shunting engines engaged on auxiliary service.

Dr. W. M. Frazer, Medical Officer of Health, said the existence of so much smoke, part of which came from railways, was seriously damaging to the amenities of the city and harmful to public health. The position with regard to legal remedies, however, was not entirely satisfactory, although more satisfactory than many people thought.

The Regulation of Railways Act, 1868, laid it down that every steam locomotive using coal or similar fuel should be constructed on the principal of consuming its own smoke, and a penalty of £5 could be imposed on offenders. When it came to making charges against a railway company, however, there was a difficulty, because local authorities—with the exception of the London County Council and those having express statutory powers—were not able to take action. The system was that of the "common informer," but it was open to officers of a local authority to act as informers in their own names. In his opinion it would be better to approach the problem in co-operation with the railways rather than displaying legal powers which were not very effective.

After further discussion the Lord Mayor proposed that the deputation should take up the matter with the railways and should consist of: Sir Thomas White and Alderman Hogan (for the City Council), Col. Sir John Shute, M.P., Mr. Alexander Critchley, M.P., Sir Richard Holt, and representatives of the Press, Chamber of Commerce, Health Department, and Liverpool University. He suggested that in the first place they should get in touch with Sir Josiah Stamp, chairman of the L.M.S., who represented all the railways concerned. If they were not satisfied with the progress of the negotiations with the companies they might approach the Ministry of Health and have Parliamentary pressure brought to bear.

The deputation interviewed Sir Josiah Stamp on 16th October.

Sheffield, Rotherham and District.

The Committee has now issued its annual report for the last year of working. As space on this occasion is limited, and as it is desirable to record fairly fully the work of the first, and so far only, statutory committee, the report will be reviewed in the next issue. The continued success of this committee will be an important factor when the desirability of instituting similar committees elsewhere is being considered.

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Announcement of the British Electrical Development Association, Inc., 2 Savoy Hill, London, W.C. 2. *Telephone : Temple Bar 9434.*

PRESS COMMENTS

AS OTHERS SEE US

A Winning Cause.

An air as of a winning cause marks the Smoke Abatement Exhibition at the Science Museum. That this is not a mere projection of the promoters' enthusiasm is obvious from a cursory study of the exhibits. Vested interests that, forty years ago, fought pioneers of abatement with every weapon in the armoury of big business, to-day are only too eager to take space in an exhibition designed to further a once-despised cause. —*Birmingham Post.*

The Domestic Hearth.

When a new factory or power-house is built in a town there is a great outcry about pollution of the atmosphere. That is as it should be: and such outcries have led to efficient combustion of smoke by the plant that makes it. The moral of the Smoke Abatement Exhibition, described elsewhere in this issue, seems to be that most of the pollution is due now to the fires not of industry but of the domestic hearth. In opening the exhibition the Minister of Health spoke hopefully; but the exhibition, showing on the one hand what care and learning and labour public bodies are expending on smoke abatement, shows on the other hand the harm that is still being done by smoke to health, to wealth, to spirits, to clothes, to stonework, to vegetation, to life in general. And, in spite of the prevalence of gas and electricity, the smoke is mostly coming from the wasteful, the pernicious domestic hearth.

—*The Times.*

Still a Dream.

Clean streets, good drains, clear water, these we demand. Clean air is still a dream. And the diseases which are men's worst enemies take shelter in the pall. We lose not merely sunshine, but life in the smoke. —*The Star.*

Agreed.

We hope, however, the Exhibition will strengthen the hands of the Smoke Abatement Society, so that no slackening of its efforts to purify the air that the town-dweller has to breathe may be imposed upon it by want of support.—*Engineering.*

Ripening Opinion.

Public opinion is ripening for some widespread endeavour to minimize the smoke nuisance in every large centre of population. A time of the year is approaching when the life of the community is seriously hampered by fog, but all the year round heavy loss to property and to health is caused by the defilement and corrosive action of a sooty atmosphere.

—*Weekly Scotsman.*

A Tribute.

The National Smoke Abatement Society have every cause to be proud of the progress which they have made in the difficult task of awakening public opinion to the seriousness of the problem of air pollution.

—*North Wales Observer.*

By Geometrical Progression.

It is, of course, well known that smoke affects the lungs, keeps out the sun, and attacks vegetation. Every year with unfailing regularity and admirable persistence the National Smoke Abatement Society crosses the t's and dots the i's. Yet there is hardly a suburban house that has not its open fire. No doubt the propaganda is having its effect. The progress of any reform proceeds by geometrical progression. He who has never used tobacco never feels the need of it. He who has never used open fires never feels the need of them. As the plain coal fire becomes less and less common, so are they likely to become less and less common because people become accustomed to doing without them. Future generations will perhaps know nothing except smokeless fuel. No doubt there will come a time when it will become possible to forbid the retailing of plain untreated coal.—*Local Government Chronicle.*

To Fight Without Remission.

The whole teaching of the exhibition is that smoke is an enemy to man and nature—and even a destroyer of inanimate matter—which it is incumbent upon us to fight without remission.—*Truth.*

Smoke in the Air.

Autumn disguised himself in sunshine to-day; but his unmistakable nip is in the air. Household fires are alight again. All over London wisps of smoke begin to curl and swirl from domestic-chimney pots. Presently those unobtrusive wisps will meet and gather and conspire with the humid atmosphere, and we shall be enjoying one of Londons' own special fogs again . . . .

Smoke is the embodiment of waste. Its presence means bad combustion, bad fuelling. Industry has in large measure eliminated bad fuelling. The smoke from factories is only a quarter of what it was a generation ago. But the domestic hearth remains wasteful and unscientific. One thing only has saved us from fogs even worse than those our fathers new—the enormous spread of fuels other than raw coal.—*Evening Standard.*

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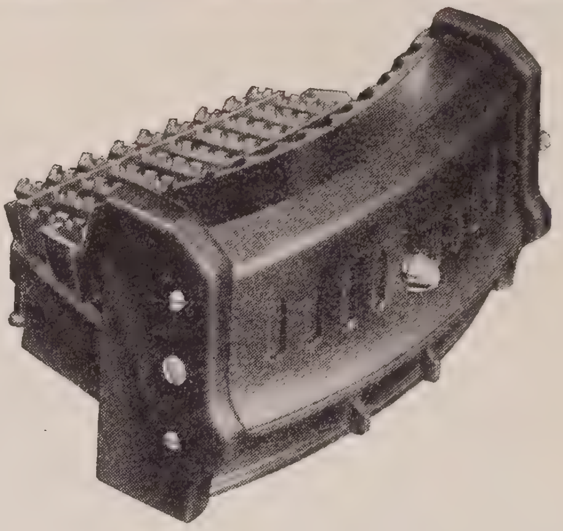

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THE LIGHT IS SWEET

By JOHN ROBERTS, D.I.C., M.I.Min.E., F.G.S.

" Breathing Clean Air Under a Sapphire Sky ! "

It is on a sunny afternoon in June that I commence to write these notes, while sitting under the trees in my tiny garden. Near by, but not in the shade, my son is doing some " revision " work, at ease in a deck chair, clad only in shorts and slippers. His limbs are already nicely tanned, for his favourite summer pastimes are swimming and sun-bathing—

Breathing clean air under a sapphire sky !
How good it is to be alive this day.

* * * * *

Here in the tannery of wind and sun ;
Hardening the health, storing melodious cheer.
Huw Menai. (*Back in the Return*).

The sky is cloudless. The chimneys of neighbouring houses, which in the winter represent miniature volcanoes emitting volumes of black smoke, are now lying dormant. There is no coal smoke in the heavens.

It is typical of the attitude of the rising generation that they appreciate the benefits of sunshine, the open air and clear atmospheres, and it is appropriate that at the time when I am about to pen these notes with the object of furthering the cause of smoke abatement, which makes for cleaner and purer atmospheres, more sunlight, the abolition of smoke fog, and the general improvement in the health and comfort of the community, my son should give me a practical demonstration of his appreciation of the theme.

" We have Piped unto you."

It is gratifying also to be able to record that the attitude of the householder towards smoke abatement and smokeless fuels has markedly changed during post-war years. There are several reasons for this ; the desire for greater comfort, cleanliness, and the avoidance of useless labour and waste, has caused them to direct their attention to the use of fuels which give the maximum efficiency, consistent with reasonable cost. It is over 35 years since the pioneers of the Smoke Abatement Society started their campaign, and after 25 years' work some of their staunchest supporters felt disposed to commence their discourses with the text : " *We have piped unto you and ye have not danced ; we have mourned unto you and ye have not lamented* " (Matt. 11, 17), but they can now take fresh heart, for we have evidence that their efforts are bearing fruit. The public is becoming *smokeless fuel conscious*, and more and more appreciative of the reduction in the frequency and intensity of smoke fogs, of the benefits to be derived from clean atmospheres, and of the health-promoting effects of sunlight.

"The Sun shall be Darkened in His Going forth."

One can rarely approach the question of coal utilization without calling to mind the familiar phrase " bottled sunbeams," coined by Stephenson, the inventor of the locomotive, and applied to the motive power—coal—used to drive his engine. That phrase aptly describes the raw material—coal.

Pieces of coal hewn from the deeps of earth
Here in my hand, spectra of lights retain ;
Crystal on crystal knit, back in its birth—
Sun meeting sun again.
Huw Menai. (*Through the Upcast Shaft*).

Every schoolboy is taught that coal was formed from vegetation, which originally derived its store of energy from the sun, in the far-off carboniferous period of geology, hundreds of millions of years ago. Nature has preserved this store for mankind, but unfortunately we have failed to appreciate it fully. What has not been brought home to the consumer is the fact that ordinary domestic coal is not a finished product, but a raw material and that when it is burnt in the domestic grate with the emission of smoke, we are not using these " bottled sunbeams " to the best advantage, but are really casting them into the atmosphere to blot out most effectively what sunshine we receive in this climate. Nature is thus being doubly outraged, and we are doing our utmost to fulfil the prophecy : " *For the stars of heaven and the constellations thereof shall not give their light : the sun shall be darkened in his going forth, and the moon shall not cause her light to shine.*" (Isa. 13, 10).

" And the Residue Thereof."

It cannot be too strongly urged, or too often repeated, that coal is just a raw material, from which a very large number of useful commodities can be obtained by suitable heat treatment, or carbonization, and subsequent chemical treatment of the by-products. The main product may be solid fuel, or it may be gas ; other products are sometimes termed *residuals.* " Coal-petrol," or benzole, is only one of many. The fertilizer, sulphate of ammonia, is well known ; so is coal tar. This latter product is the source of an endless variety of dyes and other commodities. The dye industry in particular was for many years a very profitable one, especially in Germany, where they developed an immense industry, which really arose out of the discovery of the famous English chemist, Dr. W. H. Perkin, who made the first coal-tar dye. It was said that the Germans made £500,000,000 profit out of coal-tar dyes in pre-war years. They found a " gold mine " in this residual product of coal carbonization. Again the Scriptures come to mind : " *And the residue thereof he maketh a god, even his graven image.*" (Isa. 44, 17).

HEALTH RESORT

AT BUXTON, as at all resorts similarly given over to the promotion of good health, purity of atmosphere amounts to stock-in-trade. In the choice of modernized gas works equipment a very big factor was the necessity for smoke-free operation. And, as at many other health centres, the chosen carbonizing plant was an installation of

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The first coal-tar dye factory was erected at Greenford, Middlesex, and was only recently demolished to make room for the expansion of the factory of a famous catering firm. The new factory is a monument to foresight, enterprise, and efficency—the other was a monument to the Englishman's failure to grasp a golden opportunity. Perhaps it was as well that the old factory was pulled down, to allow enterprise full sway.

By-products of Coal.

Among the other by-products of coal and coal tar are drugs, perfumes, preservatives, disinfectants, explosives, etc. The following " versified catalogue " may help the young reader to remember them ;—

The coal dug from the soil yields the "bitter almond oil" ;
The perfume of the woodruff and the fragrant tonka bean.
From tar most men recoil, but the chemist he will toil,
And bring forth the substance which we know as coumarien.

Preservatives for milk, and dyes for cloth and silk,
Are now made indirectly from the products of coal tar.
A point I want to stress is that the colours of girls' dresses
Are recovered from the source that yields us benzole for the car.

The dressing on our country roads is made of pitch and tar,
And timber steeped in creosote the weather fails to mar.
Materials of the garage roof and mackintosh are waterproof,
Because they have been treated with solutions from coal tar.

Picric acid, strange to tell, fills a high-explosive shell ;
Yet this acid as a dressing helps to heal a wound as well!
Folk may disinfect with cresol or a product known as lysol—
Coal-tar antiseptics for contagion to dispel.

Hydro-quinone and pyro (I also ought to state),
Which are used in developing a photographic plate ;
Like sulphate fertilizers, which make crops "early risers,"
Are included in by-products recovered up to date.

" Truly the Light is Sweet."

When smoky coal is burnt in the raw state, it may be said that all these by-products are discharged into the atmosphere. Let us consider for a moment what this means. Products which would yield the most beautiful colours are simply converted into filth and grime ; the antiseptics are sent forth in a cloud to obstruct the action of the best, most effective, and cheapest of all antiseptics, namely, the sun ; the fertilizer in the smoke plays its part in preventing the sun from imparting the proper quota of vitamins to the green vegetable matter ; the parent substance of photographic reagents, while in the form of smoke, itself makes photography difficult in winter months ; the milk preservatives, instead of being usefully employed, blight the grass on which the cow should graze. Cows never flourish in smoky atmospheres, and it has been demonstrated by Professor Cohen and others that such atmospheres have a strong retarding influence on the growth of vegetation. Now, if dirt can be described as " matter in the wrong place," surely the burning of raw smoky coal without regard to smoke prevention is a dirty business ! The use of smokeless fuels, on the other hand, reduces the smoke evil, and adds to the number of hours of sunshine.

" The sun is the great dispeller of ill-humours. He is the great healer, the life bringer. He is the only true doctor to the troubled mind. He is the best apothecary in the world. There is no tonic sold for gold over any chemists' counter so remedial as that celestial pick-me-up which is poured for nothing at daybreak, over the wide counter which is the rim of the earth." (Norman Davey).

It is no new discovery that the sun is the great healer, its beneficial effects having been known throughout the ages, being recognised as a great remedy for the promotion of health, and the prevention as well as the treatment of disease.

" *Truly the light is sweet, and a pleasant thing it is for the eyes to behold the sun.*" (Ecc. 11, 7).

" There Shall come from the North a Smoke."

The production of coal smoke has been a source of nuisance for at least seven centuries. In 1257, when Henry III invaded Wales, Queen Eleanor was left to stay at Nottingham, but her stay was short, as she removed to Tutbury on account of the " smoke of the seacoals." In those days the fireplaces in use were those originally designed for burning wood, and were quite unsuitable for burning coal, but the the production of smoke has not disappeared with the development of modern grates. On the contrary, for some of the worst examples of smoke production in open grates can be observed to-day by the guests in the hall of a certain hotel in that city.

The export trade in coal from Newcastle commenced in the early part of the reign of Henry III. In 1228 it was sent to London by sea, hence the term " sea-coale." where it was used as a fuel for smiths and limeburners in Seacoal Lane, also known as Limeburners' Lane. It had already proved to be somewhat of a nuisance in the days of Edward I, to whom complaint was lodged by the nobility and gentry, which resulted in a Proclamation forbidding its use in London and the suburbs. " *Howl O gate ; cry O city ; . . . . . for there shall come from the north a smoke . . . . . for morning by morning shall it pass over, by day and by night ; and it shall be a vexation.*" (Isa. 14, 31, and 28, 19.)

In the reign of Queen Elizabeth, the use of coals from Newcastle had become somewhat intolerable, and another Proclamation was issued prohibiting its use during the sitting of Parliament, " lest the health of the knights of the shire should suffer during their residence in the Metropolis," and that in spite of the fact that the Queen had levied a tax of 4d. a ton on coal.

Parliament was again petitioned in 1649 against the use of coal, and Stowe records in his *Annals* that early in the 17th century " the nice dames of London would not come into any house or roome where sea-coales were burned, nor willingly eat of meat that was either sod or roasted with sea-coal fire."

" And a Brightness was About it."

We do not know whether there was any Welsh influence behind the petitions mentioned, but during the Elizabethan period the qualities and smokelessness of the coals of Neath and Pembrokeshire were already appreciated in certain quarters. Thus George Owen, Lord of Henllys, wrote, after referring to the fact some of the " gentlemen of the sheere " were well served with wood for fuel, " those that dwelle neere the cole or that may have it carried by water with ease, use most

Continued on page 111

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NEWS AND VIEWS

Sir Francis Goodenough.

Sir Francis Goodenough, whose photograph appears above, has recently retired from the post of Executive Chairman of the British Commercial Gas Association, an office he has held since the Association was set up in 1911 to represent the commercial interests of the whole British Gas Industry. He was responsible for the first national co-operative advertising scheme to be introduced in this country—a practice which has to-day countless adherents. During the past twenty-five years he has been a strenuous advocate of both advertising and of education in salesmanship, and has held many important posts in connection with these outside the gas industry.

In 1931 Sir Francis retired from the position of Controller of Gas Sales at the Gas Light and Coke Company. He had entered its service as a boy in 1888 and he had worked his way in a dozen years from the ranks to a key position in the world's greatest gas company.

His interest in education remains as intense as ever. He was Chairman of the committee responsible for the International Congress on Commercial Education, which was addressed by King Edward, then Prince of Wales. In the course of his work for our improved system of commercial and industrial education, Sir Francis has been closely associated with Lord Eustace Percy. Lord Eustace is President of the British Association for Commercial and Industrial Education, and for seven years Sir Francis has served with him as Chairman.

Without ostentation, Sir Francis has devoted much of his scanty leisure to working for social and charitable movements. He is Chairman of the Board of Management of the Princess Beatrice Hospital, and Honorary Treasurer of the Winter Distress League and the British Institute of Social Service. He has for many years been a member and valuable friend of the National Smoke Abatement Society, and our sincerest good wishes go with him in his retirement.

The Annual Report on Alkali, etc. Works.

A gratifying amount of attention is devoted in the 72nd Annual Report of the Chief Inspectors on Alkali, Etc. Works, for the year 1935. It was remarked in the last Report that the public was becoming more concerned about air cleanliness and evidence is not lacking that this concern is growing apace, the Report states.

The different types of smoke nuisance are usefully reviewed, and the survey concludes by stating that " A certain amount of work on smoke abatement has been done by the Alkali Department in the past in connection with complaints and inquiries relating to unregistered works and it is intended, where possible, to extend this work in the future."

Then follows a valuable section on smoke and fumes from burning Colliery Spoil Banks, which was the subject of one of the resolutions adopted at the Society's recent Annual Meeting. Pressure of space at the moment prevents this being quoted in full, but is is hoped to refer to it in the next issue of the *Journal.* The Report is published by H.M. Stationery Office, and is sold at ninepence.

Smoke Abatement in Halifax.

The Halifax Health Report for 1935-36 contains a section on smoke abatement, from which the following practical paragraph may be extracted :

" Despite the growing popularity of the use of gas, electricity, and solid smokeless fuel, there appears to have been little, if any, diminution in the amount of domestic smoke issued during the year under review. This may be partly accounted for by the large number of houses which have been erected in the Borough. In this connection, it may be pointed out that all housing authorities and private persons engaged in the building of houses, have to-day a unique opportunity of making a

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notable contribution towards the diminution of domestic smoke, by making full use of whatever smokeless appliances are found to be available and practicable. It is fervently hoped that the experiment of this local authority in erecting 203 houses which will be entirely smokeless will be so successful as to justify its continuance. If this is to be accomplished three points are absolutely essential: (1) Adequate supplies of alternative smokeless fuel must be available, (2) The cost of these fuels must be reasonable and comparable with the cost of soft bituminous coal, (3) The public making use of these fuels must get rid of the obsession that there is "is nothing like a coal fire."

Smoke Abatement in Bengal.

The 30th Annual Report of the Bengal Smoke Nuisances Commission for the year 1935 records a further year of effective administration in smoke prevention in and around Calcutta. Departmental action was taken in 1484 offences, telephone warnings were given in 963 offences; 4,820 inspections and tests were carried out, and 12 prosecutions made.

The Commission was again represented at the Calcutta Health Welfare Week. Exhibits showed the evil effects of smoke nuisance and air pollution on the local respiratory mortality, the poisoning of food supplies and the effects on trees, buildings, and distant localities. The Calcutta Electric Supply Corporation and the Oriental Gas Company greatly assisted the section in displaying smokeless gas and electrical appliances for cooking and other domestic purposes, as a permanent solution of the evils of smoke. The public showed great interest in this section.

Progress in New Zealand.

The Sunlight League of New Zealand is actively concerned with smoke abatement, especially in Christchurch. "One particularly foggy morning," says the current Annual Report, "the Chairman of the Smoke Abatement Sub-committee, Mr. A. J. Scott, posted to all this city's leading furnace owners some fifty little handbooks upon the fuelling of furnaces, and the methods of prevention of smoke, which the League has imported from England through the National Smoke Abatement Society. Several gratifying letters were received, and we congratulated the Woolston Tanneries, Adams's Pottery, and Taylor's Dyeworks for their public-spirited action in preventing pollution of the air, through the installation of up-to-date smoke-consuming plants, and commend also their foresight in lessening their fuel bills."

The City and Guilds Examination.

The first examinations in Boilerhouse Practice of the City and Guilds of London Institute have been eminently successful. 112 candidates sat for the examination, of whom 85 passed. The report states that the standard which many of the candidates attained was unexpectedly high, and that the number of out and out failures was very small. The Institute's Bronze Medal was won by Mr. J. B. Atherton, of the College of Technology, Manchester. 31 candidates sat at the Glasgow centre, 19 at Leeds, and 14 at Manchester. There were also four candidates who took the examination in India.

Scottish Branch Reports.

The Scottish Branch of the Society has issued its Annual Report for 1935-36. Included in this is a chart showing the average annual deposits of solids in Glasgow for each year since 1916, which shows the marked improvement that has taken place over the period. The report mentions the evidence given by the Branch before the Committee on Scottish Health Services and states that the draft of the Committee's report to the Secretary of State for Scotland has now been completed and it is expected will be made public at an early date.

The Report, which may be obtained from Mr. A. Riddet, Hon. Secretary of the Branch, at City Chambers, Glasgow, is a full record of steady and increasingly successful activity in Scotland.

THE LIGHT IS SWEET.—*continued.*

cole fiers in their kitchings, and same in their halles, because it is a ready fiere, and very good and sweet to rost and boyle meate, and void of smoke where yll chymnies are, and doth not require man's labour to cleve wood and feede the fire continually . . . . . This cole may be nombered as one of the cheffe comodities of this country, and soe necessarie as without it the country would be in great disstress. It is called stone cole, for the hardness thereof, and is burned in chimnies and grates of iron; and, being once kindled, giveth a greater heate then light and deliteth to burn in darke places . . . . This kindle of cole is not noysome for the smoke, nor nothing so lothsome for the smell as the ring cole is, whose smoake annoyeth all things neere it as fine lynen, men's hands that warm themselves by it; but this stone cole yeeldeth, in a manner, noe smoke after it is kindled, and is soe pure that fine camerish or lawne is usually dried by it without any staine, blemishe, and is a most proved good dryer of mault therein, passing wood, fern, or strawe." (*Coal*, by Wilkins),

In 1595 Thomas Owen proposed to transport smokeless coal and anthracite to London in order to rid the Metropolis of smoke.

The open fires of Welsh anthracite to be found in many homes in Carmarthenshire are delightful to behold, and I have pleasant recollections of a clean sootless, smokeless, incandescent fire, effectively heating a large room of about 4,500 cubic feet capacity (about 20 × 20 × 12 ft.) and receiveng no attention for a period of eight hours. "*And brightness was about it . . . . . as the colour of amber, out of the midst of the fire,*" (Ezek. 1, 4). [*To be concluded in the next issue.*

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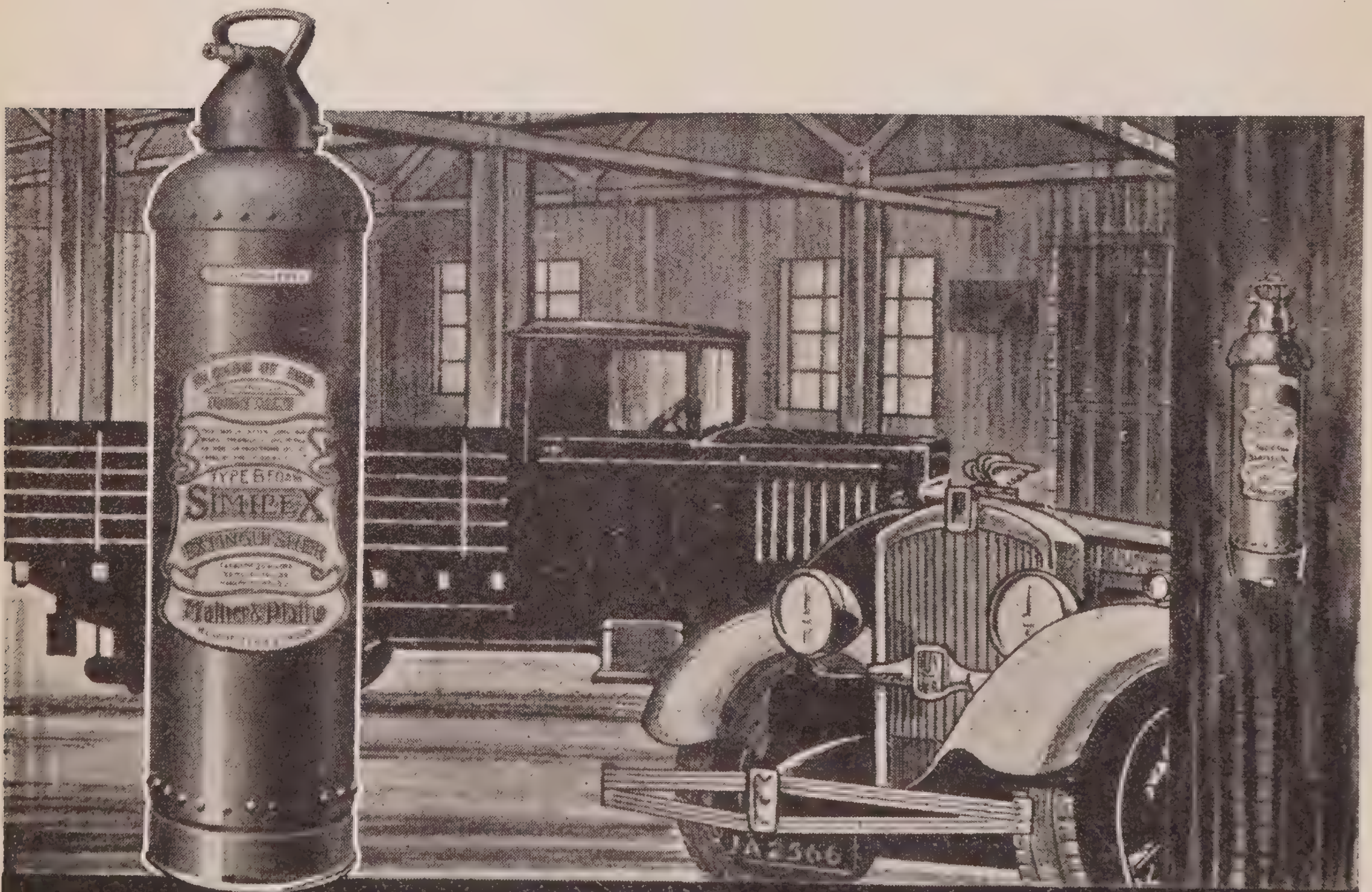

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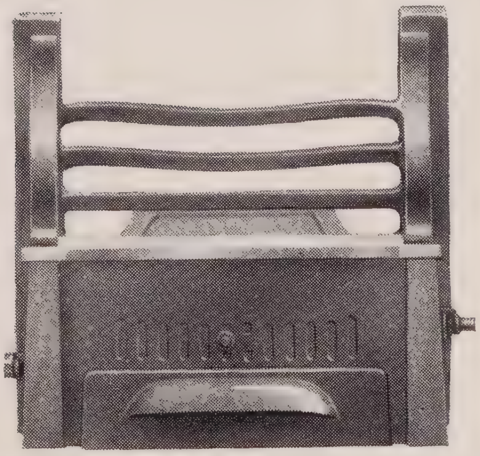

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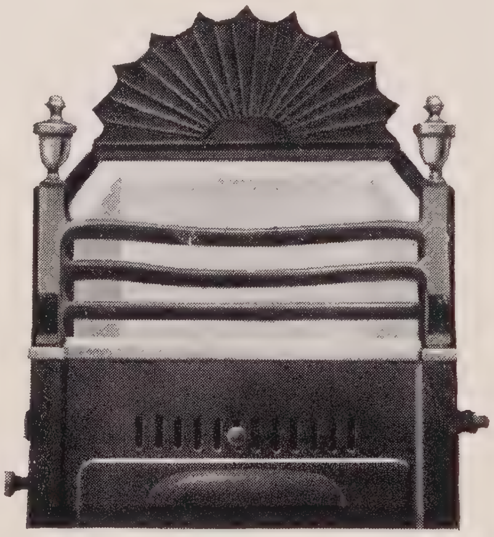

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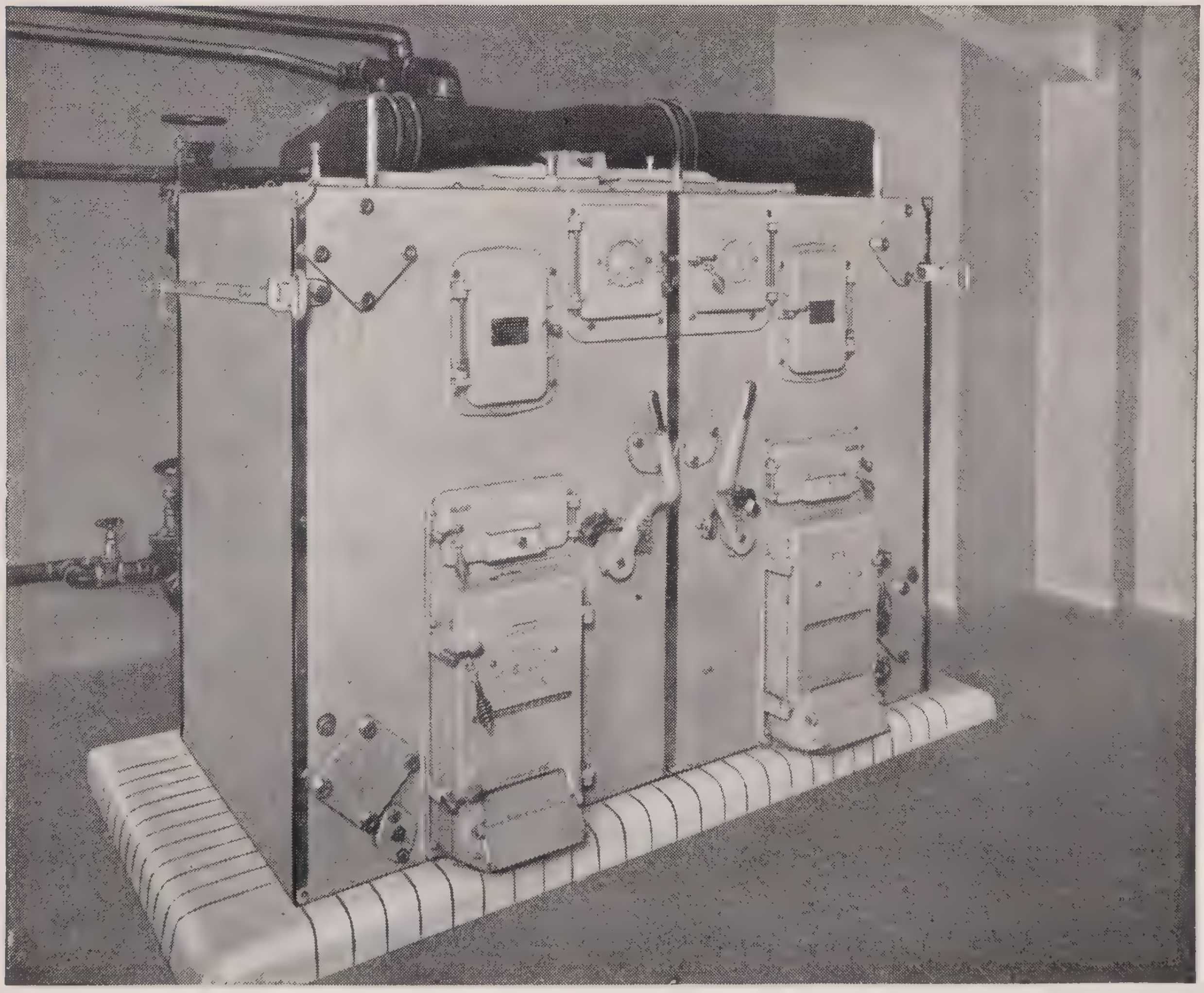

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